Carrier
United Technologies

# AquaSnap® 30MPA,MPW015-045 Liquid Chillers with Scroll Compressors and *Comfort*Link Controls

# Controls, Start-Up, Operation, Service, and Troubleshooting

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**Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.**



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## SAFETY CONSIDERATIONS

Installing, starting up, and servicing this equipment can be hazardous due to system pressures, electrical components, and equipment location (elevated structures, mechanical rooms, etc.). Only trained, qualified installers and service mechanics should install, start up, and service this equipment.

When working on this equipment, observe precautions in the literature, and on tags, stickers, and labels attached to the equipment, and any other safety precautions that apply. Follow all safety codes. Wear safety glasses and work gloves. Use care in handling, rigging, and setting this equipment, and in handling all electrical components.

**⚠ WARNING**

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

**⚠ WARNING**

DO NOT VENT refrigerant relief valves within a building. Outlet from relief valves must be vented outdoors in accordance with the latest edition of ANSI/ASHRAE (American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers) 15 (Safety Code for Mechanical Refrigeration). The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation. Provide adequate ventilation in enclosed or low overhead areas. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness or death. Misuse can be fatal. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation. Decomposition products are hazardous.

**⚠ WARNING**

DO NOT USE TORCH to remove any component. System contains oil and refrigerant under pressure.

To remove a component, wear protective gloves and goggles and proceed as follows:

a. Shut off electrical power to unit.
b. Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.
c. Traces of vapor should be displaced with nitrogen and the work area should be well ventilated. Refrigerant in contact with an open flame produces toxic gases.
d. Cut component connection tubing with tubing cutter and remove component from unit. Use a pan to catch any oil that may come out of the lines and as a gage for how much oil to add to the system.
e. Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

Failure to follow these procedures may result in personal injury or death.

**⚠ CAUTION**

DO NOT re-use compressor oil or any oil that has been exposed to the atmosphere. Dispose of oil per local codes and regulations. DO NOT leave refrigerant system open to air any longer than the actual time required to service the equipment. Seal circuits being serviced and charge with dry nitrogen to prevent oil contamination when timely repairs cannot be completed. Failure to follow these procedures may result in damage to equipment.

**⚠ CAUTION**

This unit uses a microprocessor-based electronic control system. Do not use jumpers or other tools to short out components, or to bypass or otherwise depart from recommended procedures. Any short-to-ground of the control board or accompanying wiring may destroy the electronic modules or electrical components.

**⚠ CAUTION**

To prevent potential damage to heat exchanger, always run fluid through heat exchanger when adding or removing refrigerant charge. Use appropriate brine solutions in cooler fluid loop to prevent the freezing of brazed plate heat exchanger when the equipment is exposed to temperatures below 32 F (0° C). Proof of flow switch is factory installed on all models. Do NOT remove power from this chiller during winter shutdown periods without taking precaution to remove all water from heat exchanger and optional hydronic system. Failure to properly protect the system from freezing may constitute abuse and may void warranty.

**⚠ CAUTION**

Compressors require specific rotation. Monitor control alarms during first compressor start-up for reverse rotation protection. Damage to unit may result.

**⚠ CAUTION**

Refrigerant charge must be removed slowly to prevent loss of compressor oil that could result in compressor failure.

**⚠ CAUTION**

Puron® refrigerant (R-410A) systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on Puron refrigerant equipment. If service equipment is not rated for Puron refrigerant, equipment damage or personal injury may result.

## GENERAL

This publication contains Start-Up, Service, Controls, Operation, and Troubleshooting information for the 30MPW water-cooled chillers and the 30MPA air-cooled chillers. See Table 1. These liquid chillers are equipped with *Comfort*Link controls and conventional thermostatic expansion valves (TXVs). The 30MPA units and the 30MPW units with optional medium temperature brine are also equipped with liquid line solenoid valves (LLSVs).

**⚠ CAUTION**

This unit uses a microprocessor-based electronic control system. Do not use jumpers or other tools to short out or bypass components or otherwise depart from recommended procedures. Any short-to-ground of the control board or accompanying wiring may destroy the board or electrical component.

**Table 1 — Unit Sizes**

| UNIT MODEL | NOMINAL TONS |
|---|---|
| **30MPA,MPW015** | 15 |
| **30MPA,MPW020** | 20 |
| **30MPA,MPW030** | 30 |
| **30MPA,MPW040** | 40 |
| **30MPA,MPW045** | 45 |

**Conventions Used in This Manual —** The following conventions for discussing configuration points for the local display (scrolling marquee or Navigator™ accessory) will be used in this manual.

Point names will be written with the mode name first, then any sub-modes, then the point name, each separated by an arrow symbol (→). Names will also be shown in bold and italics. As an example, the Minimum Load Valve Select Point, which is located in the Configuration mode, Option 1 sub-mode, would be written as ***Configuration→OPT1→MLV.S***.

This path name will show the user how to navigate through the local display to reach the desired configuration. The user would scroll through the modes and sub-modes using the ▲ and ▼ keys. The arrow symbol in the path name represents pressing ENTER to move into the next level of the menu structure.

When a value is included as part of the path name, it will be shown at the end of the path name after an equals sign. If the value represents a configuration setting, an explanation will be shown in parenthesis after the value. As an example, ***Configuration→OPT1→MLV.S = YES*** (Minimum Load Valve Select).

Pressing the ESCAPE and ENTER keys simultaneously will scroll an expanded text description of the point name or value across the display. The expanded description is shown in the local display tables but will not be shown with the path names in text.

The CCN (Carrier Comfort Network®) point names are also referenced in the local display tables for users configuring the unit with CCN software instead of the local display. The CCN tables are located in Appendix B of the manual.

### Basic Control Usage

SCROLLING MARQUEE DISPLAY — The scrolling marquee display is the standard interface display to the *Comfort*Link control system for 30MP units. The display has up and down arrow keys, an ENTER key, and an ESCAPE key. These keys are used to navigate through the different levels of the display structure. Press the ESCAPE key until the highest operating level is displayed to move through the top 11 mode levels indicated by LEDs (light-emitting diodes) on the left side of the display. See Fig. 1 and Table 2.

Once within a mode or sub-mode, pressing the ENTER and ESCAPE keys simultaneously will put the scrolling marquee display into expanded text mode where the full meaning of all sub-modes, items and their values can be displayed for the current selection. Press the ENTER and ESCAPE keys to return the scrolling marquee display to its default menu of rotating display items (those items in ***Run Status→VIEW***). In addition, the password will be disabled, requiring that it be entered again before changes can be made to password protected items. Press the ESCAPE key to exit out of the expanded text mode.

NOTE: When the Language Selection (***Configuration→DISP→LANG***), variable is changed, all appropriate display expansions will immediately change to the new language. No power-off or control reset is required when reconfiguring languages.

When a specific item is located, the item name alternates with the value. Press the ENTER key at a changeable item and the value will be displayed. Press ENTER again and the value will begin to flash indicating that the value can be changed. Use the up and down arrow keys to change the value, and confirm the value by pressing the ENTER key.

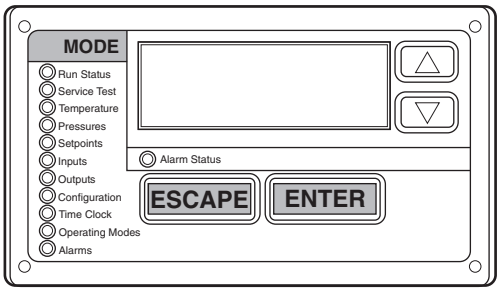



**Fig. 1 — Scrolling Marquee Display**

Changing item values or testing outputs is accomplished in the same manner. Locate and display the desired item. Press ENTER so that the item value flashes. Use the arrow keys to change the value or state and press the ENTER key to accept it. Press the ESCAPE key to return to the next higher level of structure. Repeat the process as required for other items.

Items in the Configuration and Service Test modes are password protected. The words 'PASS' and 'WORD' will alternate on the display when required. The default password is 0111. Press ENTER and the 1111 password will be displayed. Press ENTER again and the first digit will begin to flash. Use the arrow keys to change the number and press ENTER to accept the digit. Continue with the remaining digits of the password. The password can only be changed through CCN operator interface software such as ComfortWORKS®, ComfortVIEW™ and Service Tool.

See Table 3 and Appendix A for further details.

ACCESSORY NAVIGATOR™ DISPLAY MODULE — The Navigator module provides a mobile user interface to the *Comfort*Link control system. The display has up and down arrow keys, an ENTER key, and an ESCAPE key. These

keys are used to navigate through the different levels of the display structure. Press the ESCAPE key until 'Select a Menu Item' is displayed to move through the top 11 mode levels indicated by LEDs on the left side of the display. See Fig. 2.

Once within a Mode or sub-mode, a ">" indicates the currently selected item on the display screen. Pressing the ENTER and ESCAPE keys simultaneously will put the Navigator module into expanded text mode where the full meaning of all sub-modes, items and their values can be displayed. Pressing the ENTER and ESCAPE keys when the display says 'Select Menu Item' (Mode LED level) will return the Navigator module to its default menu of rotating display items (those items in ***Run Status→VIEW***). In addition, the password will be disabled, requiring that it be entered again before changes can be made to password protected items. Press the ESCAPE key to exit out of the expanded text mode.

NOTE: When the Language Selection (***Configuration→DISP→LANG***), variable is changed, all appropriate display expansions will immediately change to the new language. No power-off or control reset is required when reconfiguring languages.

When a specific item is located, the item name appears on the left of the display, the value will appear near the middle of the display and the units (if any) will appear on the far right of the display. Press the ENTER key at a changeable item and the value will begin to flash. Use the up and down arrow keys to change the value, and confirm the value by pressing the ENTER key.

Changing item values or testing outputs is accomplished in the same manner. Locate and display the desired item. Press ENTER so that the item value flashes. Use the arrow keys to change the value or state and press the ENTER key to accept it. Press the ESCAPE key to return to the next higher level of structure. Repeat the process as required for other items.

Items in the Configuration and Service Test modes are password protected. The words **Enter Password** will be displayed when required, with 1111 also being displayed. The default password is 1111. Use the arrow keys to change the number and press ENTER to enter the digit. Continue with the remaining digits of the password. The password can only be changed through CCN operator interface software such as ComfortWORKS, ComfortVIEW and Service Tool.

Adjusting the Contrast — The contrast of the display can be adjusted to suit ambient conditions. To adjust the contrast of the Navigator module, press the ESCAPE key until the display reads, "Select a menu item." Using the arrow keys move to the Configuration mode. Press ENTER to obtain access to this mode. The display will read:

> TEST OFF
METR OFF
LANG ENGLISH

Pressing ENTER will cause the "OFF" to flash. Use the up or down arrow to change "OFF" to "ON". Pressing ENTER will illuminate all LEDs and display all pixels in the view screen. Pressing ENTER and ESCAPE simultaneously allows the user to adjust the display contrast. Use the up or down arrows to adjust the contrast. The screen's contrast will change with the adjustment. Press ENTER to accept the change. The Navigator module will keep this setting as long as it is plugged in to the LEN bus.

Adjusting the Backlight Brightness — The backlight of the display can be adjusted to suit ambient conditions. The factory default is set to the highest level. To adjust the backlight of the Navigator module, press the ESCAPE key until the display reads, "Select a menu item." Using the arrow keys move to the Configuration mode. Press ENTER to obtain access to this mode. The display will read:

> TEST OFF
METR OFF
LANG ENGLISH

Pressing ENTER will cause the "OFF" to flash. Use the up or down arrow keys to change "OFF" to "ON". Pressing ENTER will illuminate all LEDs and display all pixels in the view screen. Pressing the up and down arrow keys simultaneously allows the user to adjust the display brightness. Use the up or down arrow keys to adjust screen brightness. Press ENTER to accept the change. The Navigator module will keep this setting as long as it is plugged in to the LEN bus.

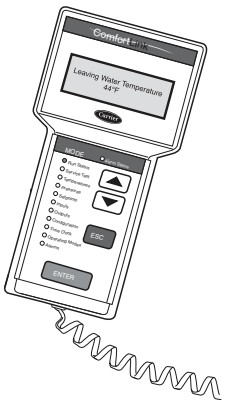



**Fig. 2 — Accessory Navigator™ Display Module**

## Table 2 — Scrolling Marquee Display Menu Structure*

| MODE | RUN STATUS | SERVICE TEST | TEMPERATURES | PRESSURES | SET POINTS | INPUTS | OUTPUTS | CONFIGURATION | TIME CLOCK | OPERATING MODES | ALARMS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Auto View of Run Status (VIEW) | Service Test Mode (TEST) | Unit Temperatures (UNIT) | Pressures Circuit A (PRC.A) | Cooling Setpoints (COOL) | General Inputs (GEN.I) | General Outputs (GEN.O) | Display Configuration (DISP) | Time of Day (TIME) | Modes (MODE) | Current (CRNT) |
| | Unit Run Hour and Start (RUN) | Outputs and Pumps (OUTS) | Temperatures Circuit A (CIR.A) | | Head Pressure Setpoint (HEAD) | Circuit Inputs (CRCT) | Outputs Circuit A (CIR.A) | Unit Configuration (UNIT) | Month, Date, Day, and Year (DATE) | | Reset Alarms (RCRN) |
| | Circuit and Compressor Run Hours (HOUR) | Ciruit A Comp Test (CMPA) | | | Brine Freeze Setpoint (FRZ) | 4-20mA Inputs (4-20) | | Unit Options 1 Hardware (OPT1) | Daylight Savings Time (DST) | | Alarm History (HIST) |
| | Compressor Starts (STRT) | | | | | | | Unit Options 2 Controls (OPT2) | Local Holiday Schedules (HOL.L) | | |
| **SUB-MODE** | Preventive Maintenance (PM) | | | | | | | CCN Network Configuration (CCN) | Schedule Number (SCH.N) | | |
| | Software Version (VERS) | | | | | | | Reset Cool Temp (RSET) | Local Occu-pancy Schedule (SCH.L) | | |
| | | | | | | | | Set Point and Ramp Load (SLCT) | Schedule Override (OVR) | | |
| | | | | | | | | Service Configuration (SERV) | | | |
| | | | | | | | | Broadcast Configuration (BCST) | | | |

LEGEND

**Ckt —** Circuit

*Throughout this text, the location of items in the menu structure will be described in the following format:

Item Expansion (Mode Name→Sub-mode Name→ITEM)

For example, using the language selection item:

Language Selection (***Configuration→DISP→LANG***)

## Table 3 — Operating Modes

| MODE NO. | ITEM EXPANSION | DESCRIPTION |
|---|---|---|
| 01 | CSM CONTROLLING CHILLER | Chillervisor System Manager (CSM) is controlling the chiller. |
| 02 | WSM CONTROLLING CHILLER | Water System Manager (WSM) is controlling the chiller. |
| 03 | MASTER/SLAVE CONTROL | Dual Chiller control is enabled. |
| 05 | RAMP LOAD LIMITED | Ramp load (pull-down) limiting in effect. In this mode, the rate at which leaving fluid temperature is dropped is limited to a predetermined value to prevent compressor overloading. See Cooling Ramp Loading (***Configuration→SLCT→CRMP***). The pull-down limit can be modified, if desired, to any rate from 0.2° F to 2° F (0.1° to 1° C)/minute. |
| 06 | TIMED OVERRIDE IN EFFECT | Timed override is in effect. This is a 1 to 4 hour temporary override of the programmed schedule, forcing unit to Occupied mode. Override can be implemented with unit under Local (Enable) or CCN (Carrier Comfort Network®) control. Override expires after each use. |
| 07 | LOW COOLER SUCTION TEMPA | Circuit A cooler Freeze Protection mode. At least one compressor must be on, and the Saturated Suction Temperature is not increasing greater than 1.1° F (0.6° C) in 10 seconds. If the saturated suction temperature is less than the Brine Freeze Point (***Set Points→FRZ →BR.FZ***) minus 6° F (3.4° C) and less than the leaving fluid temperature minus 14° F (7.8° C) for 2 minutes, a stage of capacity will be removed from the circuit. Or, If the saturated suction temperature is less than the Brine Freeze Point minus 14° F (7.8° C), for 90 seconds, a stage of capacity will be removed from the circuit. The control will continue to decrease capacity as long as either condition exists. |
| 09 | SLOW CHANGE OVERRIDE | Slow change override is in effect. The leaving fluid temperature is close to and moving towards the control point. |
| 10 | MINIMUM OFF TIME ACTIVE | Chiller is being held off by Minutes Off Time (***Configuration→OPT2→DELY***). |
| 13 | DUAL SETPOINT | Dual Set Point mode is in effect. Chiller controls to Cooling Set Point 1 (***Set Points→COOL →CSP.1***) during occupied periods and Cooling Set Point 2 (***Set Points →COOL→CSP.2***) during unoccupied periods. |
| 14 | TEMPERATURE RESET | Temperature reset is in effect. In this mode, chiller is using temperature reset to adjust leaving fluid set point upward and is currently controlling to the modified set point. The set point can be modified based on return fluid, outdoor-air-temperature, space temperature, or 4 to 20 mA signal. |
| 15 | DEMAND LIMITED | Demand limit is in effect. This indicates that the capacity of the chiller is being limited by demand limit control option. Because of this limitation, the chiller may not be able to produce the desired leaving fluid temperature. Demand limit can be controlled by switch inputs or a 4 to 20 mA signal. |
| 16 | COOLER FREEZE PROTECTION | Cooler fluid temperatures are approaching the Freeze point (see Alarms and Alerts section for definition). The chiller will be shut down when either fluid temperature falls below the Freeze point. |
| 17 | LOW TEMPERATURE COOLING | Chiller is in Cooling mode and the rate of change of the leaving fluid is negative and decreasing faster than -0.5° F per minute. Error between leaving fluid and control point exceeds fixed amount. Control will automatically unload the chiller if necessary. |
| 18 | HIGH TEMPERATURE COOLING | Chiller is in Cooling mode and the rate of change of the leaving fluid is positive and increasing. Error between leaving fluid and control point exceeds fixed amount. Control will automatically load the chiller if necessary to better match the increasing load. |
| 19 | MAKING ICE | Chiller is in an unoccupied mode and is using Cooling Set Point 3 (***Set Points →COOL →CSP.3***) to make ice. The ice done input to the Energy Management Module (EMM) is open. |
| 20 | STORING ICE | Chiller is in an unoccupied mode and is controlling to Cooling Set Point 2 (***Set Points →COOL →CSP.2***). The ice done input to the Energy Management Module (EMM) is closed. |
| 21 | HIGH SCT CIRCUIT A | Chiller is in a Cooling mode and the Saturated Condensing Temperature (SCT) is greater than the calculated maximum limit. No additional stages of capacity will be added. Chiller capacity may be reduced if SCT continues to rise to avoid high-pressure switch trips by reducing condensing temperature. |
| 23 | MINIMUM COMP ON TIME | Cooling load may be satisfied, however control continues to operate compressor to ensure proper oil return. May be an indication of oversized application, low fluid flow rate or low loop volume. |
| 24 | PUMP OFF DELAY TIME | Cooling load is satisfied, however cooler pump continues to run for the number of minutes set by the configuration variable Cooler Pump Shutdown Delay (***Configuration→OPT1 →PM.DY***). |
| 25 | LOW SOUND MODE | Operating mode does not apply to 30MP chillers. |

LEGEND

**CSM** — Chillervisor System Manager
**SCT** — Saturated Condensing Temperature
**WSM** — Water System Manager

## CONTROLS

**General —** The 30MP liquid scroll chillers contain the *Comfort*Link electronic control system that controls and monitors all operations of the chiller.

The control system is composed of several components as listed in the sections below. See Fig. 3 for a typical control box drawing. See Fig. 4 and 5 for power and control schematics.

**Main Base Board (MBB) —** See Fig. 6. The MBB is the heart of the *Comfort*Link control system. It contains the major portion of operating software and controls the operation of the machine. The MBB continuously monitors input/output channel information received from its inputs and from all other modules. The MBB receives inputs from the discharge and suction pressure transducers and thermistors. See Table 4. The MBB also receives the feedback inputs from each compressor current sensor board and other status switches. See Table 5. The MBB also controls several outputs. Relay outputs controlled by the MBB are shown in Table 6. Information is transmitted between modules via a 3-wire communication bus or LEN (Local Equipment Network). The CCN (Carrier Comfort Network) bus is also supported. Connections to both LEN and CCN buses are made at the LVT (low voltage terminal).

**Energy Management Module (EMM) —** The EMM module is available as a factory-installed option or as a field-installed accessory. The EMM module receives 4 to 20 mA inputs for the leaving fluid temperature reset, cooling set point and demand limit functions. The EMM module also receives the switch inputs for the field-installed 2-stage demand limit and ice done functions. The EMM module communicates the status of all inputs with the MBB, and the MBB adjusts the control point, capacity limit, and other functions according to the inputs received.

**Current Sensor Board (CSB) —** The CSB is used to monitor the status of the compressors by measuring current and providing an analog input to the main base board (MBB).

**Enable/Off/Remote Contact Switch —** The Enable/Off/Remote Contact switch is a 3-position switch used to control the chiller. When switched to the Enable position the chiller is under its own control. Move the switch to the Off position to shut the chiller down. Move the switch to the Remote Contact position and a field-installed dry contact can be used to start the chiller. The contacts must be capable of handling a 24 vac, 50-mA load. In the Enable and Remote Contact (dry contacts closed) positions, the chiller is allowed to operate and respond to the scheduling configuration, CCN configuration and set point data. See Fig. 7.

**Emergency On/Off Switch —** The Emergency On/Off switch should only be used when it is required to shut the chiller off immediately. Power to the MBB, EMM, and marquee display is interrupted when this switch is off and all outputs from these modules will be turned off. See Fig. 7.

**Board Addresses —** The main base board (MBB) has a 3-position instance jumper that must be set to '1.' The EMM board has 4-position DIP switches. All switches are set to 'On' for all boards except the AUX2 board. The AUX2 board DIP switch settings are shown on the wiring schematic.

### Control Module Communication

RED LED — Proper operation of the control boards can be visually checked by looking at the red status LEDs (light-emitting diodes). When operating correctly, the red status LEDs should be blinking in unison at a rate of once every 2 seconds. If the red LEDs are not blinking in unison, verify that correct power is being supplied to all modules. Be sure that the main base board (MBB) is supplied with the current software. If necessary, reload current software. If the problem still persists, replace the MBB. A red LED that is lit continuously or blinking at a rate of once per second or faster indicates that the board should be replaced.

GREEN LED — The MBB has one green LED. The Local Equipment Network (LEN) LED should always be blinking whenever power is on. All other boards have a LEN LED which should be blinking whenever power is on. Check LEN connections for potential communication errors at the board J3 and/or J4 connectors. Communication between modules is accomplished by a 3-wire sensor bus. These 3 wires run in parallel from module to module. The J4 connector on the MBB provides both power and communication directly to the marquee display only.

YELLOW LED — The MBB has one yellow LED. The Carrier Comfort Network (CCN) LED will blink during times of network communication.

**Carrier Comfort Network® (CCN) Interface —** The 30MP chiller units can be connected to the CCN if desired. The communication bus wiring is a shielded, 3-conductor cable with drain wire and is supplied and installed in the field. See Table 7. The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system elements on either side of it. This is also required for the negative and signal ground pins of each system element. Wiring connections for CCN should be made at LVT. Consult the CCN Contractor's Manual for further information.

NOTE: Conductors and drain wire must be 20 AWG (American Wire Gage) minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon*, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of –20 C to 60 C is required. Wire manufactured by Alpha (2413 or 5463), American (A22503), Belden (8772), or Columbia (02525) meets the above mentioned requirements.

It is important when connecting to a CCN communication bus that a color coding scheme be used for the entire network to simplify the installation. It is recommended that red be used for the signal positive, black for the signal negative, and white for the signal ground. Use a similar scheme for cables containing different colored wires.

At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to a ground at one point only. If the communication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building (one point per building only). To connect the unit to the network:

1. Turn off power to the control box.
2. Cut the CCN wire and strip the ends of the red (+), white (ground), and black (–) conductors. (Substitute appropriate colors for different colored cables.)
3. Connect the red wire to (+) terminal on LVT of the plug, the white wire to COM terminal, and the black wire to the (–) terminal.
4. The RJ14 CCN connector on LVT can also be used, but is only intended for temporary connection (for example, a laptop computer running Service Tool).

* Registered trademark of DuPont.

## LEGEND FOR FIG. 3-5

**ALMR** — Alarm Relay
**AUX** — Auxilliary
**C** — Contactor, Compressor
**CB** — Circuit Breaker
**CCB** — Compressor Circuit Breaker
**CH** — Crankcase Heater
**CCH** — Crankcase Heater Relay
**CNFS** — Condenser Water Flow Switch
**CNPI** — Condenser Pump Interlock
**COMP** — Compressor
**CR** — Control Relay
**CSB** — Current Sensor Board
**CWFS** — Chilled Water Flow Switch
**CWP** — Chilled Water Pump
**DGS** — Digital Scroll Compressor
**DPT** — Discharge Pressure Transducer
**DTT** — Discharge Temperature Thermistor
**DUS** — Digital Unloader Solenoid
**EMM** — Energy Management
**EWT** — Entering Water Temperature
**FB** — Fuse Block
**FIOP** — factory Installed Option
**FU** — Fuse
**GND** — Ground
**HPS** — High-Pressure Switch
**LLSV** — Liquid Line Solenoid Valve
**LON** — Local Operating Network
**LVT** — Low Voltage Terminal
**LWT** — Leaving Water Temperature
**MBB** — Main Base Board
**MLV** — Minimum Load Valve
**MP** — Modular Motor Protection
**NEC** — National Electrical Code
**OAT** — Outdoor-Air Thermistor
**PL** — Plug
**RLY** — Relay
**SPT** — Suction Pressure Transducer
**SW** — Switch
**TB** — Terminal Block
**TRAN** — Transformer
**UPC** — Unitary Protocol Converter

Terminal Block

Terminal (Unmarked)

Terminal (Marked)

Splice


Factory Wiring


Field Wiring


Accessory or Option Wiring


To indicate common potential only; not to represent wiring.

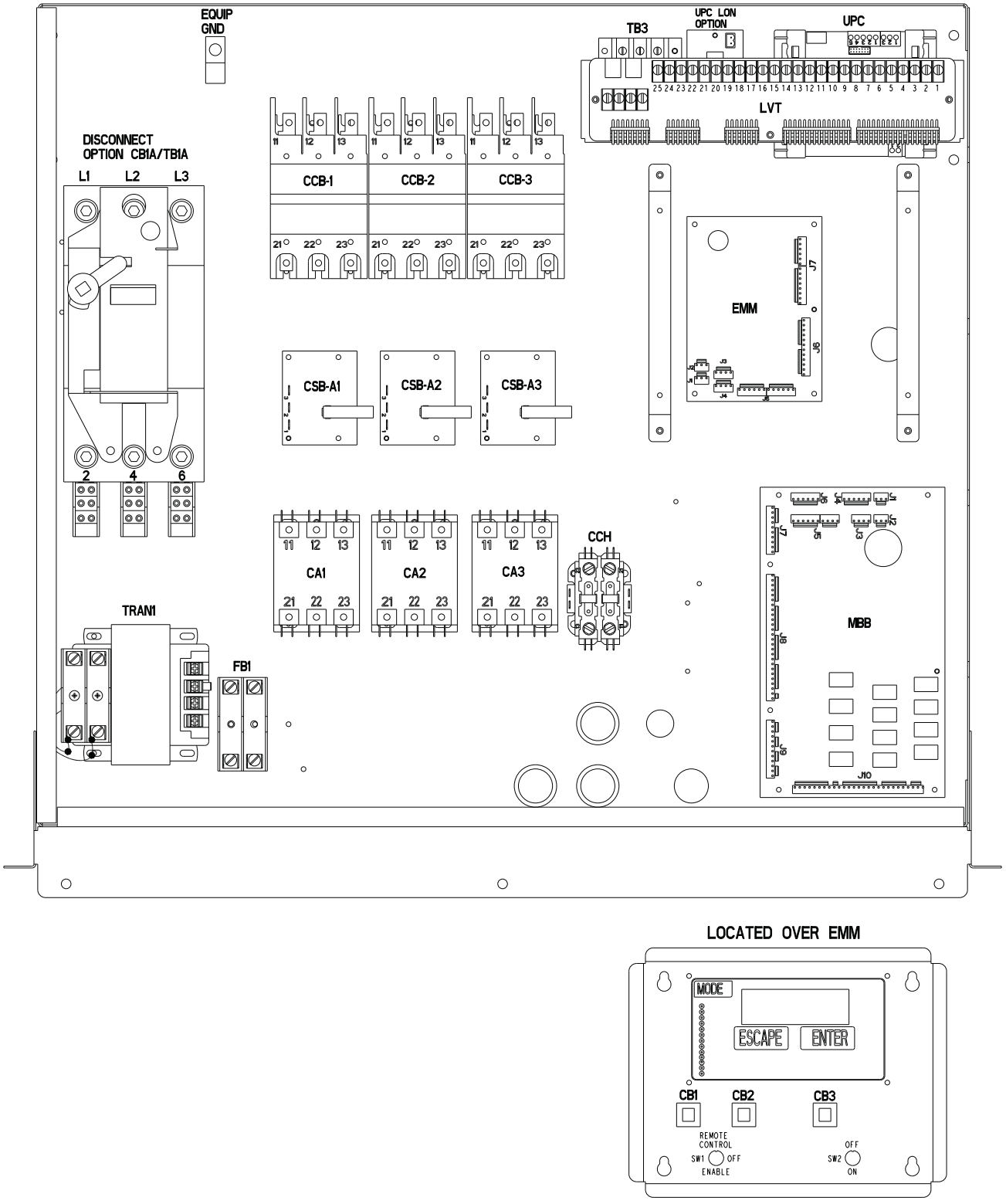
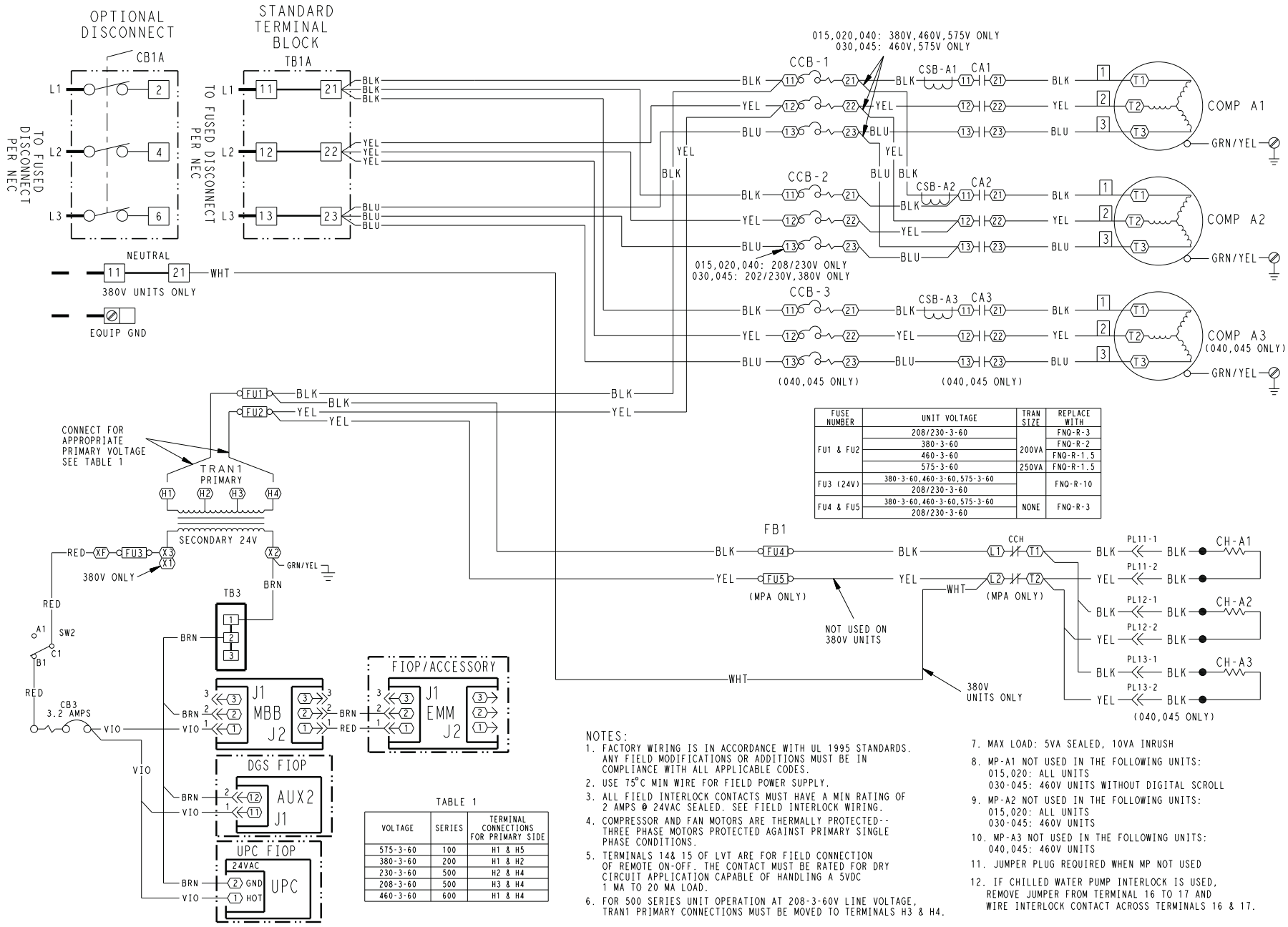



**Fig. 3 — Typical Control Box — 30MP015-045 Units**




| FUSE NUMBER | UNIT VOLTAGE | TRAN SIZE | REPLACE WITH |
|---|---|---|---|
| FU1 & FU2 | 208/230-3-60 | 200VA | FNQ-R-3 |
| | 380-3-60 | | FNQ-R-2 |
| | 460-3-60 | | FNQ-R-1.5 |
| | 575-3-60 | 250VA | FNQ-R-1.5 |
| FU3 (24V) | 380-3-60,460-3-60,575-3-60 | | FNQ-R-10 |
| | 208/230-3-60 | | |
| FU4 & FU5 | 380-3-60,460-3-60,575-3-60 | NONE | FNQ-R-3 |
| | 208/230-3-60 | | |

TABLE 1

| VOLTAGE | SERIES | TERMINAL CONNECTIONS FOR PRIMARY SIDE |
|---|---|---|
| 575-3-60 | 100 | H1 & H5 |
| 380-3-60 | 200 | H1 & H2 |
| 230-3-60 | 500 | H2 & H4 |
| 208-3-60 | 500 | H3 & H4 |
| 460-3-60 | 600 | H1 & H4 |

NOTES:
1. FACTORY WIRING IS IN ACCORDANCE WITH UL 1995 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
2. USE 75°C MIN WIRE FOR FIELD POWER SUPPLY.
3. ALL FIELD INTERLOCK CONTACTS MUST HAVE A MIN RATING OF 2 AMPS @ 24VAC SEALED. SEE FIELD INTERLOCK WIRING.
4. COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED--THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE PHASE CONDITIONS.
5. TERMINALS 14& 15 OF LVT ARE FOR FIELD CONNECTION OF REMOTE ON-OFF. THE CONTACT MUST BE RATED FOR DRY CIRCUIT APPLICATION CAPABLE OF HANDLING A 5VDC 1 MA TO 20 MA LOAD.
6. FOR 500 SERIES UNIT OPERATION AT 208-3-60V LINE VOLTAGE, TRAN1 PRIMARY CONNECTIONS MUST BE MOVED TO TERMINALS H3 & H4.
7. MAX LOAD: 5VA SEALED, 10VA INRUSH
8. MP-A1 NOT USED IN THE FOLLOWING UNITS: 015,020: ALL UNITS 030-045: 460V UNITS WITHOUT DIGITAL SCROLL
9. MP-A2 NOT USED IN THE FOLLOWING UNITS: 015,020: ALL UNITS 030-045: 460V UNITS
10. MP-A3 NOT USED IN THE FOLLOWING UNITS: 040,045: 460V UNITS
11. JUMPER PLUG REQUIRED WHEN MP NOT USED
12. IF CHILLED WATER PUMP INTERLOCK IS USED, REMOVE JUMPER FROM TERMINAL 16 TO 17 AND WIRE INTERLOCK CONTACT ACROSS TERMINALS 16 & 17.

**Fig. 4 — Typical Power Wiring Schematic — 30MP015-045 Units**

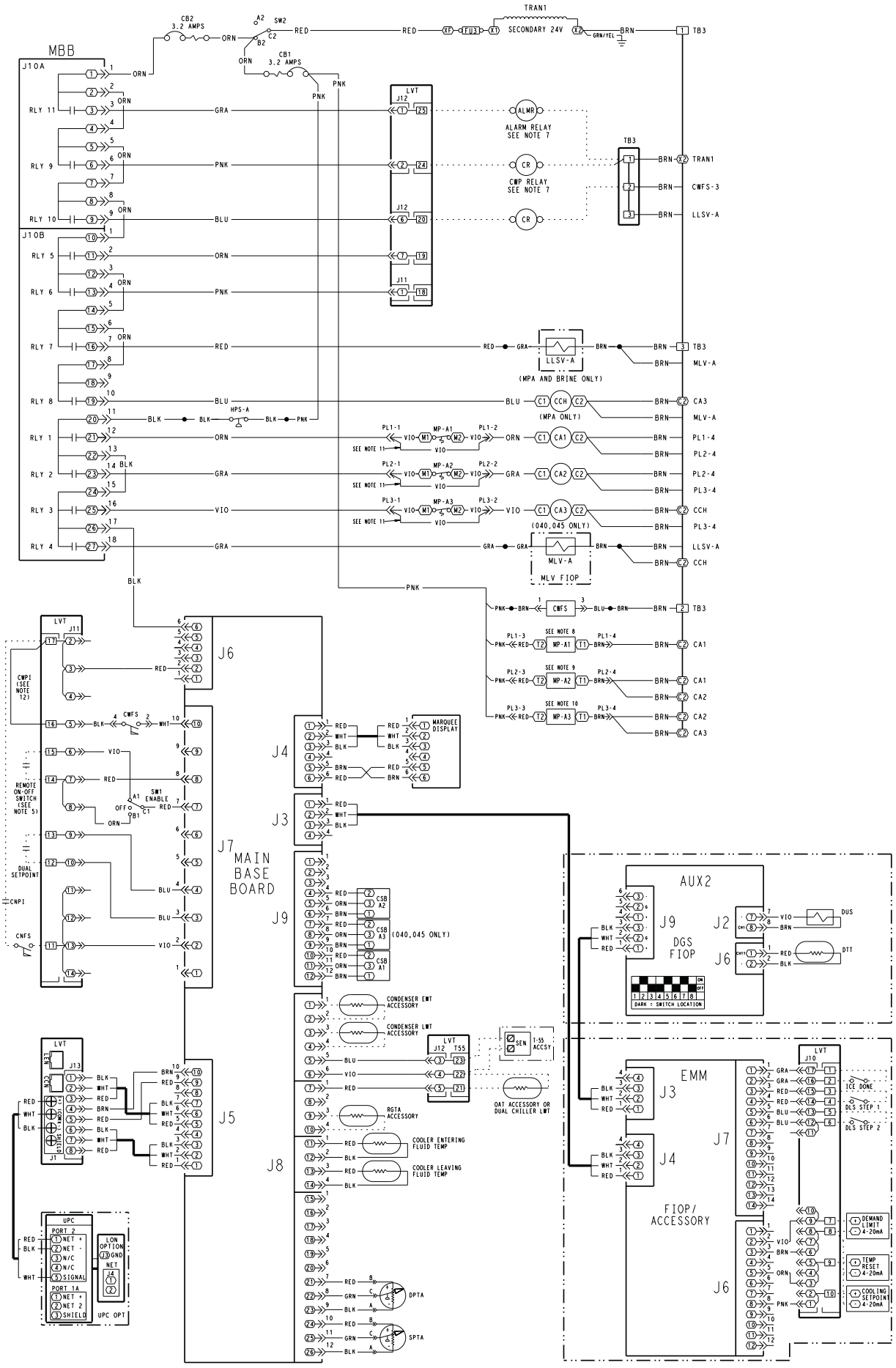



**Fig. 5 — Typical Control Wiring Schematic — 30MP015-045 Units**

IMPORTANT: A shorted CCN bus cable will prevent some routines from running and may prevent the unit from starting. If abnormal conditions occur, unplug the connector. If conditions return to normal, check the CCN connector and cable. Run new cable if necessary. A short in one section of the bus can cause problems with all system elements on the bus.

**Table 4 — Thermistor Designations**

| SCROLLING MARQUEE THERMISTOR DISPLAY NAME | PIN CONNECTION POINT | THERMISTOR INPUT |
|---|---|---|
| **CLWT** | J8-13,14 (MBB) | Cooler Leaving Fluid |
| **CEWT** | J8-11,12 (MBB) | Cooler Entering Fluid |
| **D.GAS** | J6-12 (AUX2) | Discharge Temperature Thermistor (Digital Compressor Option Only) |
| **RGTA** | J8-9,10 (MBB) | Circuit A Return Gas Temperature (accessory) |
| **OAT/DLWT** | J8-6,7 (MBB), LVT-21,22 | Outdoor-Air Temperature Sensor (accessory) or Dual LWT Sensor |
| **SPT** | J8-5,6 (MBB) LVT-22,23 | Accessory Remote Space Temperature Sensor |
| **CDET** | J8-1,2 (MBB) | Condenser Entering Water Temperature Sensor (30MPW Only) |
| **CDLT** | J8-3,4 (MBB) | Condenser Leaving Water Temperature Sensor (30MPW Only) |

LEGEND

**LWT** — Leaving Water Temperature
**MBB** — Main Base Board

**Table 5 — Status Inputs**

| STATUS SWITCH | PIN CONNECTION POINT |
|---|---|
| **Condenser Flow Switch** | LVT-11,17, J7-2, J6-2 (MBB) |
| **Dual Set Point** | LVT-12,13, J7-3,4 (MBB) |
| **Remote On/Off** | LVT-14,15, J7,8 (MBB) |
| **Cooler Flow Switch Interlock** | LVT-16,17, J6-2, J7-10 (MBB) |
| **Compressor Fault Signal, A1** | J9-11,12 (MBB) |
| **Compressor Fault Signal, A2** | J9-5,6 (MBB) |
| **Compressor Fault Signal, A3** | J9-8,9 (MBB) |

**Table 6 — Output Relays**

| RELAY NO. | DESCRIPTION |
|---|---|
| **K1** | Energize Compressor A1 |
| **K2** | Energize Compressor A2 |
| **K3** | Energize Compressor A3 |
| **K4** | Energize Minimum Load Valve |
| **K7** | Liquid Line Solenoid Valve |
| **K8** | Crankcase Heater Relay (30MPA Only) |
| **K9** | Chilled Water Pump |
| **K10** | Condenser Fan/Pump |
| **K11** | Alarm Relay |

**Table 7 — CCN Communication Bus Wiring**

| MANUFACTURER | PART NO. | |
|---|---|---|
| | Regular Wiring | Plenum Wiring |
| **Alpha** | 1895 | — |
| **American** | A21451 | A48301 |
| **Belden** | 8205 | 884421 |
| **Columbia** | D6451 | — |
| **Manhattan** | M13402 | M64430 |
| **Quabik** | 6130 | — |

**Sensors —** The electronic control uses 2 to 7 thermistors to sense temperatures for controlling chiller operation. See Table 4. These sensors are outlined below. Thermistors cooler leaving fluid, cooler entering fluid, discharge temperature, circuit A return gas temperature, outdoor-air temperature sensor or dual LWT sensor, accessory remote space temperature sensor, condenser entering fluid temperature sensor, and condenser leaving fluid temperature sensor are identical in temperature versus resistance and voltage drop performance. The dual chiller thermistor (DLWT) is 5,000 ohms at 77 F (25 C) thermistor. Space temperature thermistor (SPT) is a 10,000 ohms at 77 F (25 C). See Thermistors section for temperature-resistance-voltage drop characteristics.

COOLER LEAVING FLUID SENSOR (LWT) — The thermistor is installed in a well in the factory-installed leaving fluid piping coming from the bottom of the brazed-plate heat exchanger.

COOLER ENTERING FLUID SENSOR (EWT) — The thermistor is installed in a well in the factory-installed entering fluid piping coming from the top of the brazed-plate heat exchanger.

CONDENSER LEAVING FLUID SENSOR (CDLT) — The thermistor is installed in a well in the field-installed leaving fluid piping coming from the bottom of the brazed-plate heat exchanger. The thermistor is a field-installed accessory. See Table 8 for thermistor and well part numbers.

CONDENSER ENTERING FLUID SENSOR (CDET) — The thermistor is installed in a well in the field-installed entering fluid piping coming from the top of the brazed-plate heat exchanger. See Table 8 for thermistor and well part numbers.

COMPRESSOR RETURN GAS TEMPERATURE SENSOR (RGT.A) — This accessory thermistor can be installed in a well located in the suction line. Use Carrier part number HH79NZ029.

OUTDOOR-AIR TEMPERATURE SENSOR (OAT) — This sensor is an accessory that is remotely mounted and used for outdoor air temperature reset. See Table 4. Use Carrier part number HH79NZ023.

DUAL LEAVING WATER TEMPERATURE SENSOR (DLWT) — This input can be connected to the LVT. See Table 4. For dual chiller applications (parallel only are supported), connect the dual chiller leaving fluid temperature sensor (see Table 8 for thermistor and well part numbers) to the outside air temperature input of the Master chiller. If outside-air temperature is required for reset applications, connect the sensor to the Slave chiller and configure the slave chiller to broadcast the value to the Master chiller.

DISCHARGE TEMPERATURE THERMISTOR (D.GAS) — This sensor is only used on units with a digital compressor. The sensor is mounted on the discharge line close to the discharge of the digital compressor. It attaches to the discharge line using a spring clip and protects the system from high discharge gas temperature when the digital compressor is used. This sensor is a connected to the AUX board.

REMOTE SPACE TEMPERATURE SENSOR (SPT) — The sensor (part no. 33ZCT55SPT) is an accessory sensor that is remotely mounted in the controlled space and used for space temperature reset. The sensor should be installed as a wall-mounted thermostat would be (in the conditioned space where it will not be subjected to either a cooling or heating source or direct exposure to sunlight, and 4 to 5 ft above the floor).

Space temperature sensor wires are to be connected to terminals in the unit main control box. The space temperature sensor includes a terminal block (SEN) and a RJ11 female connector. The RJ11 connector is used access into the Carrier Comfort Network® (CCN) at the sensor.

**Table 8 — Thermistors and Wells**

| THERMISTOR PART NO. | DESCRIPTION | WELL PART NO. |
|---|---|---|
| HH79NZ014 | 3 in., 5,000 ohm Thermistor | 1DHB50106801 |
| HH79NZ029 | 4 in., 5,000 ohm Thermistor | 1DHB50106802 |

To connect the space temperature sensor (Fig. 8):

1. Using a 20 AWG twisted pair conductor cable rated for the application, connect 1 wire of the twisted pair to one SEN terminal and connect the other wire to the other SEN terminal located under the cover of the space temperature sensor.
2. Connect the other ends of the wires to terminals 3 and 4 on LVT located in the unit control box.

Units on the CCN can be monitored from the space at the sensor through the RJ11 connector, if desired. To wire the RJ11 connector into the CCN (Fig. 9):

IMPORTANT: The cable selected for the RJ11 connector wiring MUST be identical to the CCN communication bus wire used for the entire network. Refer to Table 7 for acceptable wiring.

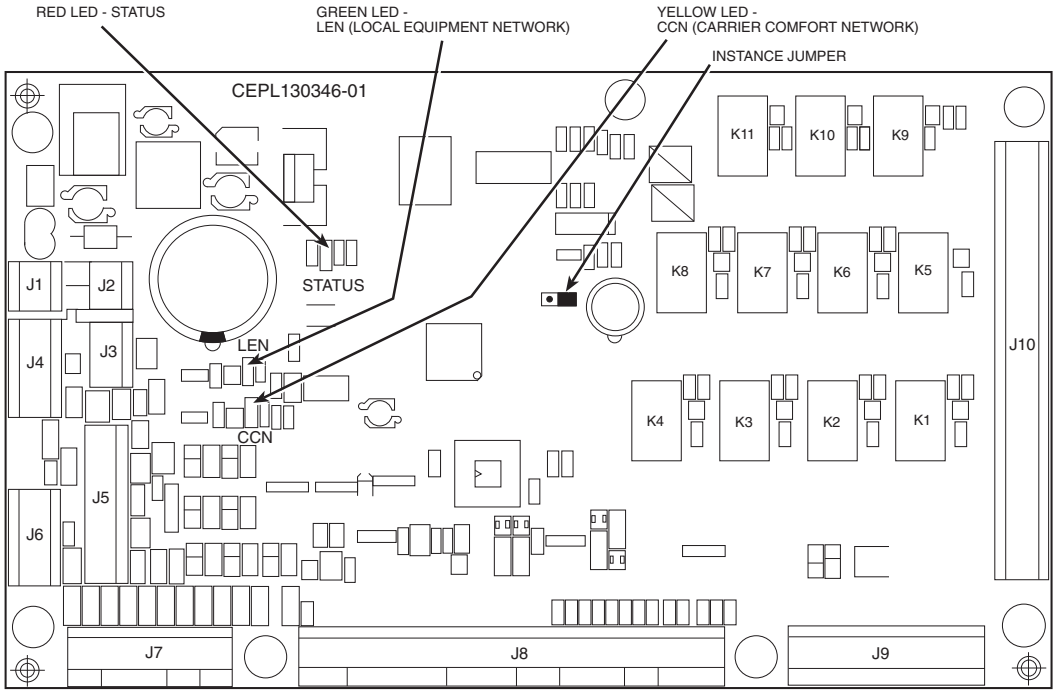



**Fig. 6 — Main Base Board**

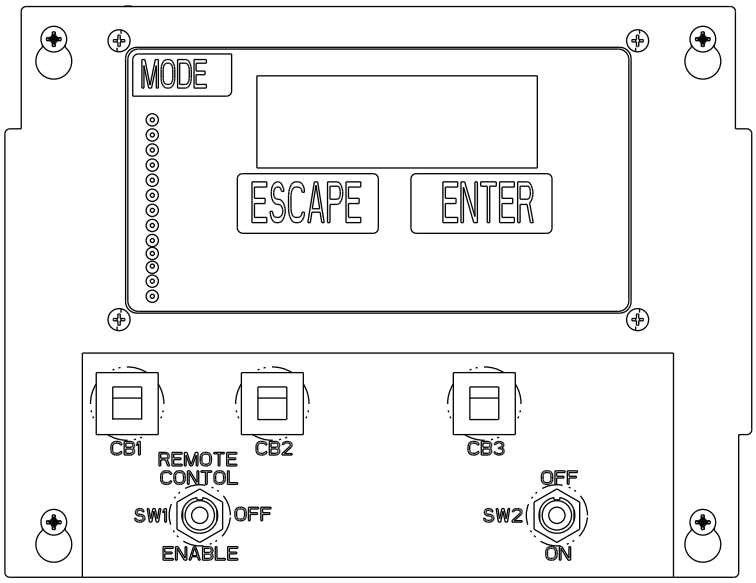



**Fig. 7 — Enable/Off/Remote Contact Switch, and Emergency On/Off Switch Locations**

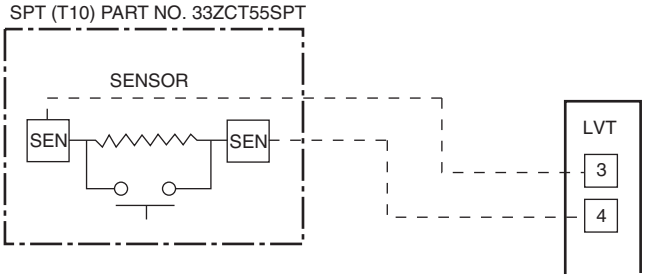



**Fig. 8 — Typical Space Temperature Sensor Wiring**

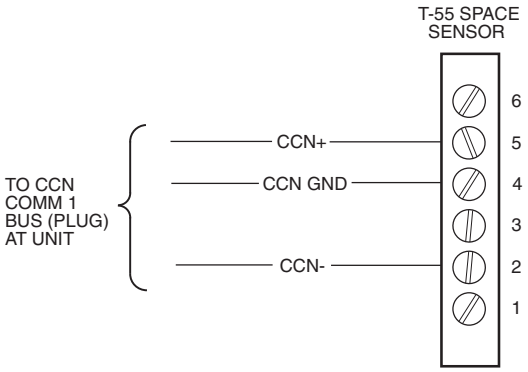



**Fig. 9 — CCN Communications Bus Wiring to Optional Space Sensor RJ11 Connector**

1. Cut the CCN wire and strip ends of the red (+), white (ground), and black (–) conductors. (If another wire color scheme is used, strip ends of appropriate wires.)
2. Insert and secure the red (+) wire to terminal 5 of the space temperature sensor terminal block.
3. Insert and secure the white (ground) wire to terminal 4 of the space temperature sensor.
4. Insert and secure the black (–) wire to terminal 2 of the space temperature sensor.
5. Connect the other end of the communication bus cable to the remainder of the CCN communication bus.

**Energy Management Module (Fig. 10) —** This factory-installed option (FIOP) or field-installed accessory is used for the following types of temperature reset, demand limit, and/or ice features:

- 4 to 20 mA leaving fluid temperature reset (requires field-supplied 4 to 20 mA generator)
- 4 to 20 mA cooling set point reset (requires field-supplied 4 to 20 mA generator)
- Discrete inputs for 2-step demand limit (requires field-supplied dry contacts capable of handling a 24 vac, 50 mA load)
- 4 to 20 mA demand limit (requires field-supplied 4 to 20 mA generator)
- Discrete input for Ice Done switch (requires field-supplied dry contacts capable of handling a 24 vac, 50 mA load)

See Demand Limit and Temperature Reset sections on pages 23 and 21 for further details.

**⚠ CAUTION**

Care should be taken when interfacing with other manufacturer's control systems due to possible power supply differences, full wave bridge versus half wave rectification. The two different power supplies cannot be mixed. *Comfort*Link controls use half wave rectification. A signal isolation device should be utilized if a full wave bridge signal generating device is used.

**Loss-of-Cooler Flow Protection —** A proof-of-cooler flow device is factory installed in all chillers.

**Condenser Flow Protection —** A proof-of-condenser flow protection accessory can be field installed in the condenser water piping of all chillers. The unit must be configured for the input to be enabled.

**Thermostatic Expansion Valves (TXV) —** All units are equipped from the factory with conventional TXVs. The 30MPA units and 30MPW units with medium temperature brine also have factory-installed liquid line solenoids. The liquid line solenoid valves are not intended to be a mechanical shut-off. For 30MPW units, when service is required, recover the refrigerant from the system.

For 30MPA units when service is required, the compressor and evaporator can be serviced by closing the factory-installed liquid line service valve and field-installed discharge line service valve. After the valves are closed, recover the refrigerant from the system.

The TXV is set at the factory to maintain approximately 8 to 12° F (4.4 to 6.7° C) suction superheat leaving the cooler by monitoring the proper amount of refrigerant into the cooler. All TXVs are adjustable, *but should not be adjusted unless absolutely necessary.*

**Capacity Control —** The control system cycles compressors, digital scroll modulating solenoid (if equipped), and minimum load valve solenoids (if equipped) to maintain the user-configured leaving chilled fluid temperature set point. Entering fluid temperature is used by the main base board (MBB) to determine the temperature drop across the cooler and is used in determining the optimum time to add or subtract capacity stages. The chilled fluid temperature set point can be automatically reset by the return fluid temperature, space, or outdoor-air temperature reset features. It can also be reset from an external 4 to 20-mA signal (requires energy management module FIOP or accessory).

The capacity control algorithm runs every 30 seconds. The algorithm attempts to maintain the Control Point at the desired set point. Each time it runs, the control reads the entering and leaving fluid temperatures. The control determines the rate at which conditions are changing and calculates 2 variables based on these conditions. Next, a capacity ratio is calculated using the 2 variables to determine whether or not to make any changes to the current stages of capacity. This ratio value ranges from –100 to +100%. If the next stage of capacity is a compressor, the control starts (stops) a compressor when the ratio reaches +100% (–100%). If installed, the minimum load valve solenoid will be energized as the last stage of capacity before turning off the last compressor. A delay of 90 seconds occurs after each capacity step change. Refer to Table 9.

MINUTES LEFT FOR START — This value is displayed only in the network display tables (using Service Tool, ComfortVIEW™ or ComfortWORKS® software) and represents the amount of time to elapse before the unit will start its initialization routine. This value can be zero without the machine running in many situations. This can include being unoccupied, ENABLE/OFF/REMOTE CONTACT switch in the OFF position, CCN not allowing unit to start, Demand

Limit in effect, no call for cooling due to no load, and alarm or alert conditions present. If the machine should be running and none of the above are true, a minimum off time (DELY, see below) may be in effect. The machine should start normally once the time limit has expired.

MINUTES OFF TIME (***Configuration→OPT2→ DELY***) — This user-configurable time period is used by the control to determine how long unit operation is delayed after power is applied/restored to the unit. Typically, this time period is configured when multiple machines are located on a single site. For example, this gives the user the ability to prevent all the units from restarting at once after a power failure. A value of zero for this variable does not mean that the unit should be running.

CAPACITY CONTROL OVERRIDES — The following overrides will modify the normal operation of the routine.

Deadband Multiplier — The user configurable Deadband Multiplier (***Configuration→SLCT→Z.GN***) has a default value of 1.0. The range is from 1.0 to 4.0. When set to other than 1.0, this factor is applied to the capacity Load/Unload Factor. The larger this value is set, the longer the control will delay between adding or removing stages of capacity. Figure 11 shows how compressor starts can be reduced over time if the leaving water temperature is allowed to drift a larger amount above and below the set point. This value should be set in the range of 3.0 to 4.0 for systems with small loop volumes. Figure 12 shows the operating envelope for the compressor.

First Stage Override — If the current capacity stage is zero, the control will modify the routine with a 1.2 factor on adding the first stage to reduce cycling. This factor is also applied when the control is attempting to remove the last stage of capacity.

Slow Change Override — The control prevents the capacity stages from being changed when the leaving fluid temperature is close to the set point (within an adjustable deadband) and moving towards the set point.

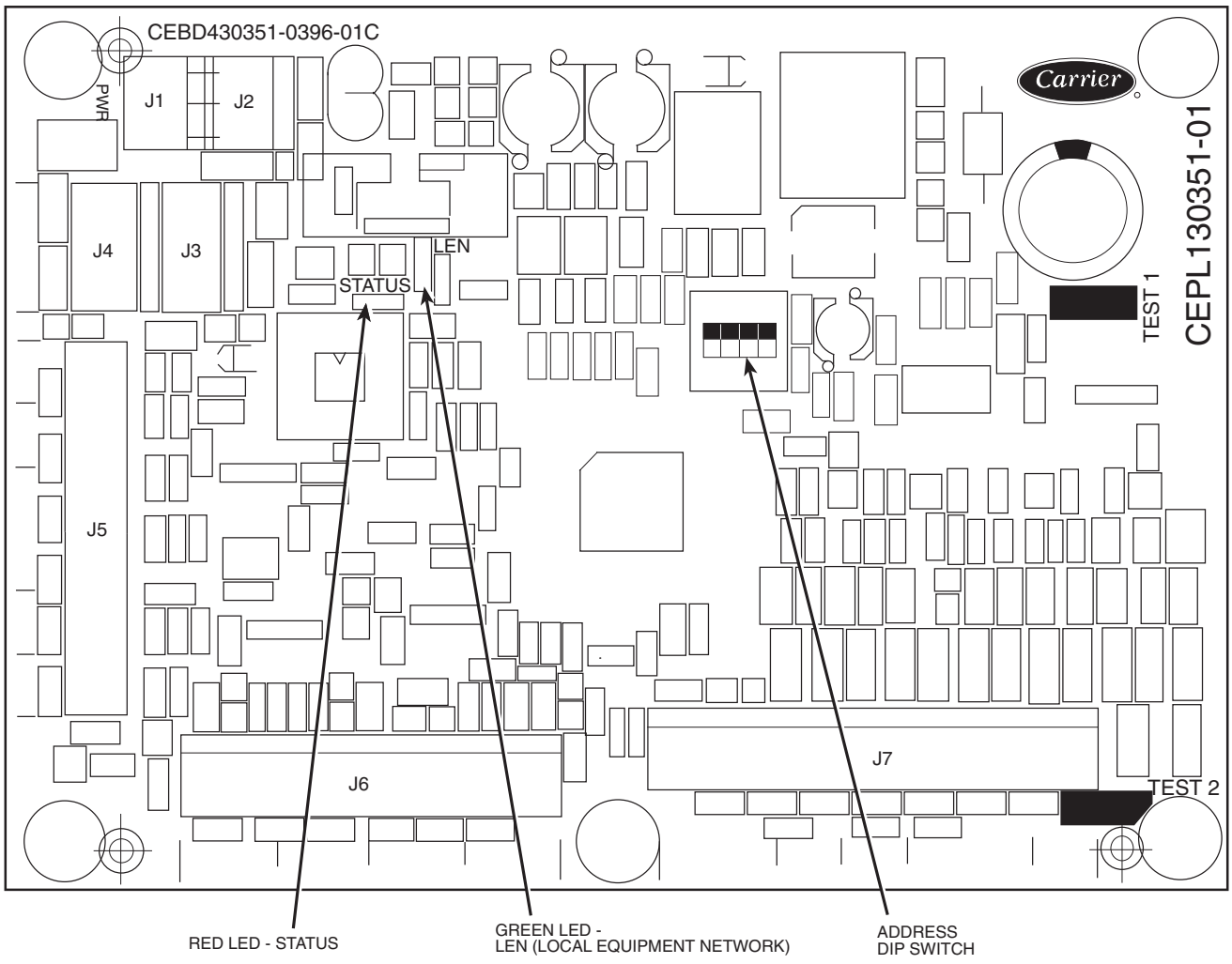


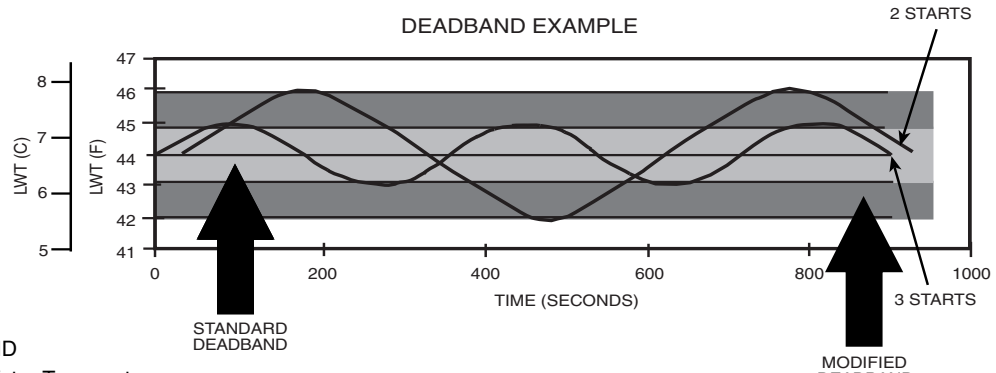

**Fig. 10 — Energy Management Module**

**Table 9 — Part Load Data Percent Displacement, Standard Units with Minimum Load Valve**

| 30MP UNIT SIZE | CONTROL STEPS | CAPACITY STEPS (% Displacement) |
|---|---|---|
| **015** | 1<br>2<br>3 | 18*<br>50<br>100 |
| **020** | 1<br>2<br>3 | 25*<br>50<br>100 |
| **030** | 1<br>2<br>3 | 34*<br>50<br>100 |
| **040** | 1<br>2<br>3<br>4 | 21*<br>33<br>67<br>100 |
| **045** | 1<br>2<br>3<br>4 | 22*<br>33<br>67<br>100 |

*Hot gas bypass (minimum load) valve energized.

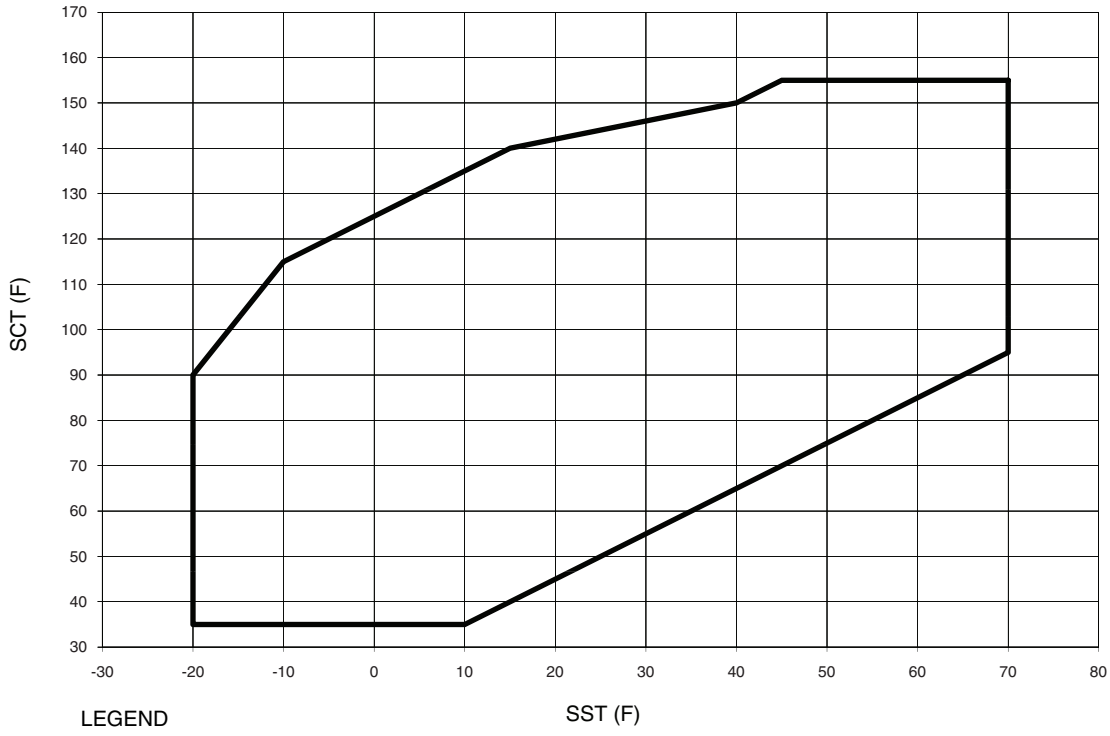
NOTE: These capacity steps may vary due to different capacity staging sequences.




LEGEND

**LWT —** Leaving Water Temperature

**Fig. 11 — Deadband Multiplier**




LEGEND

**SCT** — Saturated Condensing Temperature
**SST** — Saturated Suction Temperature

**Fig. 12 — Operating Envelope for R-410A Compressor**

Ramp Loading — Ramp loading (***Configuration→SLCT→CRMP***) limits the rate of change of leaving fluid temperature. If the unit is in a Cooling mode and configured for Ramp Loading, the control makes 2 comparisons before deciding to change stages of capacity. The control calculates a temperature difference between the control point and leaving fluid temperature. If the difference is greater than 4° F (2.2° C) and the rate of change (°F or °C per minute) is more than the configured Cooling Ramp Loading value (***CRMP***), the control does not allow any changes to the current stage of capacity.

Low Entering Fluid Temperature Unloading — When the entering fluid temperature is below the control point, the control will attempt to remove 25% of the current stages being used. If exactly 25% cannot be removed, the control removes an amount greater than 25% but no more than necessary. The lowest stage will not be removed.

Hot Gas Bypass — If equipped, the hot gas bypass valve is energized only when one compressor is running on the circuit and capacity is decreasing.

Cooler Freeze Protection — The control will try to prevent shutting the chiller down on a Cooler Freeze Protection alarm by removing stages of capacity. If the cooler fluid selected is Water, the freeze point is 34 F (1.1 C). If the cooler fluid selected is Brine, the freeze point is the Brine Freeze Point (***Set Points→FRZ→BR.FZ***). This alarm condition (A207) only references leaving fluid temperature and NOT Brine Freeze point. If the cooler leaving fluid temperature is less than the freeze point plus 2.0° F (1.1° C), the control will immediately remove one stage of capacity. This can be repeated once every 30 seconds.

Low Saturated Suction Protection — The control will try to prevent shutting a circuit down due to low saturated suction conditions by removing stages of capacity. The circuit alert condition (T116) compares saturated suction temperature to the configured Brine Freeze Point (***Set Points→FRZ→BR.FZ***). The Brine Freeze point is a user-configurable value that must be left at 34 F (1.1 C) for 100% water systems. A lower value may be entered for systems with brine solutions, but this value should be set according to the freeze protection level of the brine mixture. Failure to properly set this brine freeze point value may permanently damage the brazed plate heat exchanger. The control will initiate Mode 7 (Circuit A) to indicate a circuit's capacity is limited and that eventually the circuit may shut down.

## Operation of Machine Based on Control Method and Cooling Set Point Selection Settings —

Machine On/Off control is determined by the configuration of the Control Method (***Configuration →OPT2→CTRL***) and Cooling Set Point Select (***Configuration→SLCT→CLSP***) variables. All units are factory configured with Cooling Set Point Select set to 0 (single set point). With the control method set to 0, simply switching the Enable/Off/Remote Contact switch to the Enable or Remote Contact position (external contacts closed) will put the chiller in an occupied state. The control mode (***Run Status→VIEW→STAT***) will be 1 (OFF LOCAL) when the switch is Off and will be 5 (ON LOCAL) when in the Enable position or Remote Contact position with external contacts closed.

Two other control methods are available for Machine On/Off control:

OCCUPANCY SCHEDULE (***Configuration→OPT2 →CTRL* = 1**) — The main base board will use the operating schedules as defined under the Time Clock mode in the scrolling marquee display. These schedules are identical. The schedule number must be set to 1 for local schedule.

The schedule number can be set anywhere from 65 to 99 for operation under a CCN global schedule. The Enable/Off/Remote Contact must be in the Enable or Remote Contact position. The control mode (***Run Status→VIEW→STAT***) will be 1 when the switch is Off. The control mode will be 3 when the Enable/Off/Remote Contact switch input is On and the time of day is during an unoccupied period. Similarly, the control mode will be 7 when the time of day is during an occupied period.

CCN SCHEDULE (***Configuration→OPT2→CTRL* = 3**) — An external CCN device such as Chillervisor System Manager controls the On/Off state of the machine. This CCN device forces the variable 'CHIL_S_S' between Start/Stop to control the chiller. The control mode (***Run Status →VIEW→STAT***) will be 1 when the switch is Off. The control mode will be 3 when the Enable/Off/Remote Contact switch input is On and the CHIL_S_S variable is 'Stop.' Similarly, the control mode will be 6 when the CHIL_S_S variable is 'Start.'

Table 10 illustrates how the control method and cooling set point select variables direct the operation of the chiller and the set point to which it controls. The illustration also shows the ON/OFF state of the machine for the given combinations.

## Cooling Set Point Select

SINGLE — Unit operation is based on Cooling Set Point 1 (***Set Points→COOL→CSP.1***).

DUAL SWITCH — Unit operation is based on Cooling Set Point 1 (***Set Points→COOL→CSP.1***) when the Dual Set Point switch contacts are open and Cooling Set Point 2 (***Set Points→COOL→CSP.2***) when they are closed.

DUAL CCN OCCUPIED — Unit operation is based on Cooling Set Point 1 (***Set Points→COOL→CSP.1***) during the Occupied mode and Cooling Set Point 2 (***Set Points→COOL→CSP.2***) during the Unoccupied mode as configured under the local occupancy schedule accessible only from CCN. Schedule Number in Table SCHEDOVR (see Appendix B) must be configured to 1. If the Schedule Number is set to 0, the unit will operate in a continuous 24-hr Occupied mode. Control method must be configured to 0 (switch). See Table 10.

4 TO 20 mA INPUT — Unit operation is based on an external 4 to 20 mA signal input to the Energy Management Module (EMM).

**Table 10 — Control Methods and Cooling Set Points**

| CONTROL TYPE (CTRL) | OCCUPANCY STATE | COOLING SET POINT SELECT (CLSP) | | | |
|---|---|---|---|---|---|
| | | 0 (single) | 1 (dual, switch) | 2 (dual, occ) | 3 (4 to 20 mA) |
| 0 (switch) | Occupied | ON,CSP.1 | ON* | ON,CSP.1 | ON† |
| | Unoccupied | ON,CSP.1 | ON* | ON,CSP.2 | ON |
| 2 (Occupancy) | Occupied | ON,CSP.1 | ON* | Illegal | ON† |
| | Unoccupied | OFF | OFF | Illegal | OFF |
| 3 (CCN) | Occupied | ON,CSP.1 | ON* | ON,CSP.1 | ON† |
| | Unoccupied | ON,CSP.1 | ON* | ON,CSP.2 | ON† |

*Dual set point switch input used. CSP1 used when switch input is open. CSP2 used when switch input is closed.
†Cooling set point determined from 4 to 20 mA input to energy management module (EMM) to terminals TB6-3,5.

**Cooler Pump Control —** The AquaSnap® 30MP machines are configured with the Cooler Pump Control (***Configuration→OPT1→CPC***) = ON.

The maximum load allowed for the Chilled Water Pump Starter is 5 VA sealed, 10 VA inrush at 24 volts. The starter coil is powered from the chiller control system. The starter should be wired between LVT 24 and TB3-1. If equipped, the field-installed chilled water pump starter auxiliary contacts should be connected in series with the chilled water flow switch between LVT 16 and LVT 17.

**Ice Mode —** When Ice Mode is enabled Cooling Setpoint Select must be set to Dual Switch, Dual 7 day or Dual CCN Occupied and the energy management module (EMM) must be installed. Unit operation is based on Cooling Setpoint 1 (***CSP.1***) during the Occupied mode, Ice Setpoint (***CSP.3***) during the Unoccupied mode with the Ice Done contacts open and Cooling Setpoint 2 (***CSP.2***) during the Unoccupied mode with the Ice Done contacts closed. These 3 set points can be utilized to develop your specific control strategy.

**Service Test —** *Both main power and control circuit power must be on*.

The Service Test function should be used to verify proper operation of condenser output, compressors, minimum load valve solenoid (if installed), cooler pump, and remote alarm relay. To use the Service Test mode, the Enable/Off/Remote Contact switch must be in the OFF position. Use the display keys to enter the mode and display TEST. Press ENTER twice so that OFF flashes. Enter the password if required. Use either arrow key to change the TEST value to the ON position and press ENTER. Move the Enable/Off/Remote Contact switch to enable. Press ESCAPE and the ▼ button to enter the OUTS or COMP sub-mode. ENABLE/OFF/REMOTE switch must be ENABLE to operate test.

NOTE: Cooler and condenser (30MPW) water flow must be established in order to operate compressor in service test.

Test the condenser output, cooler pump, liquid line solenoid valve (30MPA only), crankcase heater, water valve (accessory), and alarm relay by changing the item values from OFF to ON. These discrete outputs are then turned off if there is no keypad activity for 10 minutes. When testing compressors, lead compressor must be started first. All compressor outputs can be turned on, but the control will limit the rate by staging one compressor per minute. Minimum load valve can be tested with the compressors on or off. The relays under the COMP mode will stay on for 10 minutes if there is no keypad activity. Compressors will stay on until they are turned off by the operator. The Service Test mode will remain enabled for as long as there is one or more compressors running. All safeties are monitored during this test and will turn a compressor, circuit or the machine off if required. Any other mode or sub-mode can be accessed, viewed, or changed during the TEST mode. The STAT item (***Run Status→VIEW***) will display "0" as long as the Service mode is enabled. The TEST sub-mode value must be changed back to OFF before the chiller can be switched to Enable or Remote contact for normal operation.

**Cooler Pump Sequence of Operation —** At anytime the unit is in an ON status, as defined by the one of the following conditions, the cooler pump relay will be enabled.

1. The Enable-Off-Remote Switch in ENABLE, (***CTRL***=0).
2. Enable-Off-Remote Switch in REMOTE with a Start-Stop remote contact closure (***CTRL*=0**).
3. An Occupied Time Period from an Occupancy Schedule in combination with items 1 or 2 (***CTRL*=2**).
4. A CCN Start-Stop Command to Start in combination with items 1 or 2 (***CTRL*=3**).

There are certain alarm conditions and Operating Modes that will turn the cooler pump relay ON. This sequence will describe the normal operation of the pump control algorithm.

When the unit cycles from an "On" state to an "Off' state, the cooler pump output will remain energized for the Cooler Pump Shutdown Delay (***Configuration→OPT1→PM.DY***). This is configurable from 0 to 10 minutes. The factory default is 1 minute. If the pump output was deenergized during the transition period, the pump output will not be energized.

The Cooler Pump Relay will be energized when the machine is "On." The chilled water pump interlock circuit consists of a chilled water flow switch and a field-installed chilled water pump interlock. If the chilled water pump interlock circuit does not close within five (5) minutes of starting, an A200 - Cooler Flow/Interlock failed to close at Start-Up alam1 will be generated and chiller will not be allowed to start.

If the chilled water pump interlock or chilled water flow switch opens for at least three (3) seconds after initially being closed, an A201 - Cooler Flow 1 Interlock Contacts Opened During Normal Operation alarm will be generated and the machine will stop.

**Condenser Pump/Condenser Fan Output Control —** The main base board (MBB) has the capability to control either a condenser fan output or a condenser pump output depending on the unit configuration.

If the unit is configured for ***Configuration→ UNIT→TYPE*** = 2 (air cooled), then the output will be off as long as capacity is equal to 0 and will be energized 5 seconds before a compressor is started and remain energized until capacity is 0 again.

If the unit is configured for ***Configuration→ UNIT→TYPE*** = 3 (water cooled), then the output will be used for condenser pump control and additional configuration is required. To enable the condenser pump control use ***Configuration→OPT1→D.PM.E***. The pump can be configured for no pump control (0), on when occupied (1), and on when capacity is greater than 0 (2).

**Configuring and Operating Dual Chiller Control —** The dual chiller routine is available for the control of two units supplying chilled fluid on a common loop. This control algorithm is designed for parallel fluid flow arrangement only. One chiller must be configured as the master chiller, the other as the slave. An additional leaving fluid temperature thermistor (Dual Chiller LWT) must be installed as shown in Fig. 13 and 14 and connected to the master chiller. Refer to Sensors section, page 12, for wiring. The CCN communication bus must be connected between the two chillers. Connections can be made to the CCN screw terminals on LVT. Refer to Carrier Comfort Network® Interface section, page 7, for wiring information. Configuration examples are shown in Tables 11 and 12.

## Table 11 — Dual Chiller Configuration (Master Chiller Example)

| SUB-MODE | ITEM | KEYPAD ENTRY | DISPLAY | ITEM EXPANSION | COMMENTS |
|---|---|---|---|---|---|
| DISP | | | | | |
| UNIT | | | | | |
| OPT1 | | | | | |
| OPT2 | | ENTER | CTRL | CONTROL METHOD | |
| | CTRL | ENTER | 0 | SWITCH | DEFAULT 0 |
| | | ESCAPE | OPT2 | | |
| CCN | | ↓ | CCN | | |
| | CCNA | ENTER | 1 | CCN ADDRESS | DEFAULT 1 |
| | | ↓ | CCNB | | |
| | CCNB | ENTER | 0 | CCN BUS NUMBER | DEFAULT 0 |
| | | ESCAPE | CCN | | |
| | | ↓ | RSET | | PROCEED TO SUBMODE **RESET** |
| RSET | | ENTER | CRST | COOLING RESET TYPE | |
| | | ↓ | LLEN | LEAD/LAG CHILLER ENABLE | ↓ 15 ITEMS |
| | LLEN | ENTER | DSBL | | SCROLLING STOPS |
| | | ENTER | DSBL | | VALUE FLASHES |
| | | ↑ | ENBL | | SELECT ENBL |
| | LLEN | ENTER | ENBL | LEAD/LAG CHILLER ENABLE | CHANGE ACCEPTED |
| | | ESCAPE | LLEN | | |
| | | ↓ | MSSL | MASTER /SLAVE SELECT | |
| | MSSL | ENTER | MAST | MASTER /SLAVE SELECT | DEFAULT MAST |
| | | ESCAPE | MSSL | | |
| | | ↓ | SLVA | SLAVE ADDRESS | |
| | SLVA | ENTER | 0 | | SCROLLING STOPS |
| | | ENTER | 0 | | VALUE FLASHES |
| | | ↑ | 2 | | SELECT 2 |
| | SLVA | ENTER | 2 | SLAVE ADDRESS | CHANGE ACCEPTED |
| | | ESCAPE | SLVA | | |
| | | ↓ | LLBL | LEAD/LAG BALANCE SELECT | |
| | LLBL | ENTER | 0 | | SCROLLING STOPS |
| | | ENTER | 0 | | VALUE FLASHES |
| | | ↑ | 2 | | SELECT 2 - Automatic |

**Table 11 — Dual Chiller Configuration (Master Chiller Example) (cont)**

| SUB-MODE | ITEM | KEYPAD ENTRY | DISPLAY | ITEM EXPANSION | COMMENTS |
|---|---|---|---|---|---|
| RSET | LLBL | ENTER | 2 | LEAD/LAG BALANCE SELECT | CHANGE ACCEPTED |
| | | ESCAPE | LLBL | | |
| | | ↓ | LLBD | LEAD/LAG BALANCE DELTA | |
| | LLBD | ENTER | 168 | LEAD/LAG BALANCE DELTA | DEFAULT 168 |
| | | ESCAPE | LLBD | | |
| | | ↓ | LLDY | LAG START DELAY | |
| | LLDY | ENTER | 5 | | SCROLLING STOPS |
| | | ENTER | 5 | | VALUE FLASHES |
| | | ↑ | 10 | | SELECT 10 |
| | LLDY | ENTER | 10 | LAG START DELAY | CHANGE ACCEPTED |
| | | ESCAPE | LLDY | | |
| | | ESCAPE | RSET | | |
| | PARA | ENTER | YES | | MASTER COMPLETE |

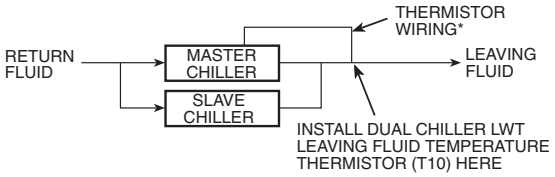
NOTES:
1. Master Control Method (CTRL) can be configured as 0-Switch, 2-Occupancy or 3-CCN.
2. Parallel Configuration (PARA) cannot be changed.

Refer to Table 11 for dual chiller configuration. In this example the master chiller will be configured at address 1 and the slave chiller at address 2. The master and slave chillers must reside on the same CCN bus (***Configuration→CCN →CCNB***) but cannot have the same CCN address (***Configuration→CCN→CCNA***). Both master and slave chillers must have Lead/Lag Chiller Enable (***Configuration→RSET →LLEN***) configured to ENBL. Master/Slave Select (***Configuration→RSET→MSSL***) must be configured to MAST for the master chiller and SLVE for the slave. Also in this example, the master chiller will be configured to use Lead/Lag Balance Select (***Configuration→RSET→LLBL***) and Lead/Lag Balance Delta (***Configuration→RSET→LLBD***) to even out the chiller run-times weekly. The Lag Start Delay (***Configuration→RSET→LLDY***) feature will be set to 10 minutes. This will prevent the lag chiller from starting until the lead chiller has been at 100% capacity for the length of the delay time. Parallel configuration (***Configuration→RSET→PARA***) can only be configured to YES. The variables ***LLBL***, ***LLBD*** and ***LLDY*** are not used by the slave chiller.

Dual chiller start/stop control is determined by configuration of Control Method (***Configuration→OPT2→CTRL***) of the Master chiller. The Slave chiller should always be configured for ***CTRL*=0** (Switch). If the chillers are to be controlled by Remote Contacts, both Master and Slave chillers should be enabled together. Two separate relays or one relay with two sets of contacts may control the chillers. The Enable/Off/Remote Contact switch should be in the Remote Contact position on both the Master and Slave chillers. The Enable/Off/Remote Contact switch should be in the Enable position for ***CTRL*=2** (Occupancy) or ***CTRL*=3** (CCN Control).

Both chillers will stop if the Master chiller Enable/Off/Remote Contact switch is in the Off position. If the Emergency Stop switch is turned off or an alarm is generated on the Master chiller the Slave chiller will operate in a Stand-Alone mode. If the Emergency Stop switch is turned off or an alarm is generated on the Slave chiller the Master chiller will operate in a Stand-Alone mode.

The master chiller controls the slave chiller by changing its Control Mode (***Run Status→VIEW→STAT***) and its operating setpoint or Control Point (***Run Status→VIEW→CT.PT***).




*Depending on piping sizes, use either:
- HH79NZ014 sensor/10HB50106801 well (3-in. sensor/well)
- HH79NZ029 sensor/10HB50106802 well (4-in. sensor/well)

**Fig. 13 — Dual Chiller Thermistor Location**

| PART NUMBER | DIMENSIONS in. (mm) | |
|---|---|---|
| | A | B |
| 10HB50106801 | 3.10 (78.7) | 1.55 (39.4) |
| 10HB50106802 | 4.10 (104.1) | 1.28 (32.5) |

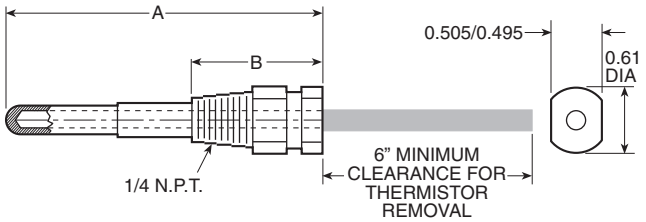



**Fig. 14 — Dual Leaving Water Thermistor Well**

## Table 12 — Dual Chiller Configuration (Slave Chiller Example)

| SUB-MODE | ITEM | KEYPAD ENTRY | DISPLAY | ITEM EXPANSION | COMMENTS |
|---|---|---|---|---|---|
| DISP | | | | | |
| UNIT | | | | | |
| OPT1 | | | | | |
| OPT2 | | ENTER | CTRL | CONTROL METHOD | |
| | CTRL | | 0 | SWITCH | DEFAULT 0 |
| | | ESCAPE | OPT2 | | |
| CCN | | ↓ | CCN | | |
| | | ↓ | CCNA | | |
| | CCNA | ENTER | 1 | CCN ADDRESS | SCROLLING STOPS |
| | | ENTER | 1 | | VALUE FLASHES |
| | | ↑ | 2 | | SELECT 2 (SEE NOTE 2) |
| | CCNA | ENTER | 2 | CCN ADDRESS | CHANGE ACCEPTED |
| | | ESCAPE | CCN | | |
| | CCNB | ENTER | 0 | CCN BUS NUMBER | DEFAULT 0 (SEE NOTE 3) |
| | | ESCAPE | CCN | | |
| | | ↓ | RSET | | PROCEED TO SUBMODE **RSET** |
| RSET | | ENTER | CRST | COOLING RESET TYPE | |
| | | ↓ | LLEN | LEAD/LAG CHILLER ENABLE | ↓ 15 ITEMS |
| | LLEN | ENTER | DSBL | | SCROLLING STOPS |
| | | ENTER | DSBL | | VALUE FLASHES |
| | | ↑ | ENBL | | SELECT ENBL |
| | LLEN | ENTER | ENBL | LEAD/LAG CHILLER ENABLE | CHANGE ACCEPTED |
| | | ESCAPE | LLEN | | |
| | | ↓ | MSSL | MASTER /SLAVE SELECT | |
| | MSSL | ENTER | MAST | | SCROLLING STOPS |
| | | ENTER | MAST | | VALUE FLASHES |
| | | ↑ | SLVE | | SELECT SLVE |
| | MSSL | ENTER | SLVE | MASTER /SLAVE SELECT | CHANGE ACCEPTED |
| | | ESCAPE | MSSL | | |
| | | ESCAPE | RSET | | SLAVE COMPLETE |

NOTES:
1. Slave Control Method (CTRL) must be configured for 0.
2. Slave CCN Address (CCNA) must be different than Master.
3. Slave CCN Bus Number (CCNB) must be the same as Master
4. Slave does not require SLVA, LLBL, LLBD, or LLDY to be configured.

**Temperature Reset —** The control system is capable of handling leaving-fluid temperature reset based on return cooler fluid temperature. Because the change in temperature through the cooler is a measure of the building load, the return temperature reset is in effect an average building load reset method. The control system is also capable of temperature reset based on outdoor-air temperature (OAT), space temperature (SPT), or from an externally powered 4 to 20 mA signal. Accessory sensors must be used for SPT reset (33ZCT55SPT) and for OAT reset (HH79NZ014). The energy management module (EMM) must be used for temperature reset using a 4 to 20 mA signal. See Tables 13 and 14.

IMPORTANT: Care should be taken when interfacing with other control systems due to possible power supply differences: full wave bridge versus half wave rectification. Connection of control devices with different power supplies may result in permanent damage. *Comfort*Link controls incorporate power supplies with half wave rectification. A signal isolation device should be utilized if the signal generator incorporates a full wave bridge rectifier.

To use outdoor air or space temperature reset, four variables must be configured. In the Configuration mode under the sub-mode RSET, items (***Configuration→RSET→CRST***), (***Configuration→RSET→RM.NO***), (***Configuration→RSET→RM.F***), and (***Configuration→RSET→RT.DG***) must be properly set. See Table 15 — Configuring Outdoor Air and Space Temperature Reset. The outdoor air reset example provides 0° F (0° C) chilled water set point reset at 85.0 F (29.4 C) outdoor-air temperature and 15.0 F (8.3 C) reset at 55.0 F (12.8 C) outdoor-air temperature. The space temperature reset example provides 0° F (0° C) chilled water set point reset at 72.0 F (22.2 C) space temperature and 6.0 F (3.3 C) reset at 68.0 F (20.0 C) space temperature. The variable ***CRST*** should be configured for the type of reset desired. The variable ***RM.NO*** should be set to the temperature that no reset should occur. The variable ***RM.F*** should be set to the temperature that maximum reset is to occur. The variable ***RM.DG*** should be set to the maximum amount of reset desired. Figures 15 and 16 are examples of outdoor air and space temperature resets.

To use return reset, four variables must be configured. In the Configuration mode under the sub-mode ***RSET***, items ***CRST***, ***RT.NO***, ***RT.F*** and ***RT.DG*** must be properly set. See Table 16 — Configuring Return Temperature Reset. This example provides 5.0 F (2.8 C) chilled water set point reset at 2.0 F (1.1 C) cooler ΔT and 0° F (0° C) reset at 10.0 F (5.6 C) cooler ΔT. The variable RT.NO should be set to the cooler temperature difference (ΔT) where no chilled water temperature reset should occur. The variable ***RT.F*** should be set to the cooler temperature difference where the maximum chilled water temperature reset should occur. The variable ***RM.DG*** should be set to the maximum amount of reset desired.

To verify that reset is functioning correctly proceed to Run Status mode, sub-mode VIEW, and subtract the Active Setpoint (***Run Status→VIEW→SETP***) from the Control Point (***Run Status→VIEW→CTPT***) to determine the degrees reset.

**Table 13 — Menu Configuration of 4 to 20 mA Cooling Set Point Control**

| MODE (RED LED) | KEYPAD ENTRY | SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|
| CONFIGURATION | ENTER | DISP | | | | | |
| | ▼ | UNIT | | | | | |
| | ▼ | OPT1 | | | | | |
| | ▼ | OPT2 | | | | | |
| | ▼ | CCN | | | | | |
| | ▼ | RSET | | | | | |
| | ▼ | SLCT | ENTER | CLSP | 0 | COOLING SETPOINT SELECT | |
| | | | ENTER | | 0 | | Scrolling Stops |
| | | | ENTER | | 0 | | Flashing ‘0’ |
| | | | ▲ | | 3 | | Select ‘3’ |
| | | | ENTER | | 3 | | Change Accepted |

**Table 14 — 4 to 20 mA Reset**

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|
| RSET | ENTER | CRST | 1 | COOLING RESET TYPE | 0 = no reset<br>1 = 4 to 20 mA input<br>2 = Outdoor air temp<br>3 = Return Fluid<br>4 = Space Temperature |
| | ▼ | MA.DG | 5.0 ΔF (2.8 ΔC) | DEGREES COOL RESET | Default: 0° F (0° C) Reset at 20 mA<br>Range: –30 to 30 F (–16.7 to 16.7 C) |

NOTE: The example above shows how to configure the chiller for 4 to 20 mA reset. No reset will occur at 4.0 mA input, and a 5.0 F reset will occur at 20.0 mA. An EMM (energy management module) is required.

**Table 15 — Configuring Outdoor Air and Space Temperature Reset**

| MODE (RED LED) | KEYPAD ENTRY | SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|---|
| | | | | | Outdoor Air | Space | | |
| CONFIGURATION | ENTER | DISP | | | | | | |
| | ▼ | UNIT | | | | | | |
| | ▼ | OPT1 | | | | | | |
| | ▼ | OPT2 | | | | | | |
| | ▼ | CCN | | | | | | |
| | ▼ | RSET | ENTER | CRST | 2 | 4 | COOLING RESET TYPE | 2 = Outdoor-Air Temperature (Connect to LVT-4,5)<br>4 = Space Temperature (Connect to LVT-3,4) |
| | | | ▼ | RM.NO* | 85 °F | 72 °F | REMOTE - NO RESET TEMP | Default: 125.0 F (51.7 C)<br>Range: 0° to125 F (–17.8 to 51.7 C) |
| | | | ▼ | RM.F | 55 °F | 68 °F | REMOTE - FULL RESET TEMP | Default: 0.0° F (-17.7 C)<br>Range: 0° to 125 F (–17.8 to 51.7 C) |
| | | | ▼ | RM.DG | 15 ΔF | 6 ΔF | REMOTE - DEGREES RESET | Default: 0° F (0° C)<br>Range: –30 to 30 F (–16.7 to -16.7 C) |

*1 item skipped in this example.

**Table 16 — Configuring Return Temperature Reset**

| MODE (RED LED) | KEYPAD ENTRY | SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|
| CONFIGURATION | ENTER | DISP | ENTER | TEST | ON/OFF | TEST DISPLAY LEDs | |
| | ▼ | UNIT | ENTER | TYPE | X | UNIT TYPE | |
| | ▼ | OPT1 | ENTER | FLUD | X | COOLER FLUID | |
| | ▼ | OPT2 | ENTER | CTRL | X | CONTROL METHOD | |
| | ▼ | CCN | | | | | |
| | ▼ | RSET | ENTER | CRST | 3 | COOLING RESET TYPE | 0 = No Reset<br>1 = 4 to 20 mA Input (EMM required) (Connect to EMM TB6-2,3)<br>2 = Outdoor-Air Temperature<br>3 = Return Fluid<br>4 = Space Temperature (Connect to TB5-5,6) |
| | | | ▼ | RT.NO* | 10.0 ΔF | RETURN FLUID - NO RESET TEMP | Default: 10.0 ΔF (5.6 ΔC)<br>Range: 0° to 30 F COOLER DT (0.0 to 16.7 C) |
| | | | ▼ | RT.F | 2.0 ΔF | RETURN FLUID - FULL RESET TEMP | Default: 0 ΔF (–17.8 ΔC)<br>Range: 0° to 30 F COOLER DT (0.0 to 16.7 C) |
| | | | ▼ | RT.DG | 5.0 ΔF | RETURN - DEGREES RESET | Default: 0 ΔF (0 ΔC)<br>Range: –30 to 30°F (–16.7 to 16.7 C) |

*1 item skipped in this example.

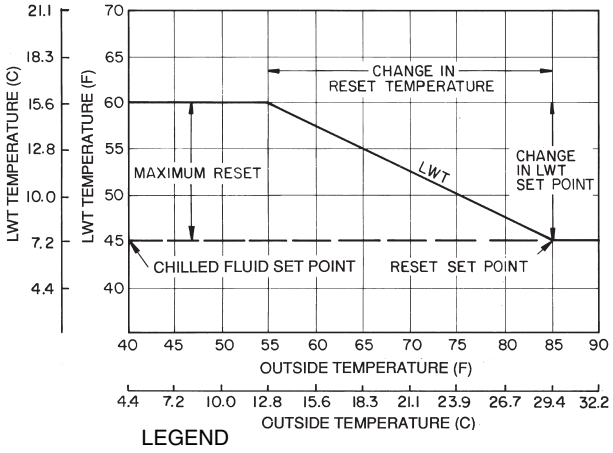
Under normal operation, the chiller will maintain a constant leaving fluid temperature approximately equal to the chilled fluid set point. As the cooler load varies, the entering cooler fluid will change in proportion to the load as shown in Fig. 17. Usually the chiller size and leaving-fluid temperature set point are selected based on a full-load condition. At part load, the fluid temperature set point may be colder than required. If the leaving fluid temperature was allowed to increase at part load, the efficiency of the machine would increase.

Return temperature reset allows for the leaving temperature set point to be reset upward as a function of the return fluid temperature or, in effect, the building load.

**Demand Limit —** Demand limit is a feature that allows the unit capacity to be limited during periods of peak energy usage. There are 3 types of demand limiting that can be configured. The first type is through 2-stage switch control, which will reduce the maximum capacity to 2 user-configurable percentages. The second type is by 4 to 20 mA signal input which will reduce the maximum capacity linearly between 100% at a 4 mA input signal (no reduction) down to the user-configurable level at a 20 mA input signal. The third type uses the CCN Loadshed module and has the ability to limit the current operating capacity to maximum and further reduce the capacity if required.

NOTE: The 2-stage switch control and 4 to 20-mA input signal types of demand limiting require the energy management module (EMM).

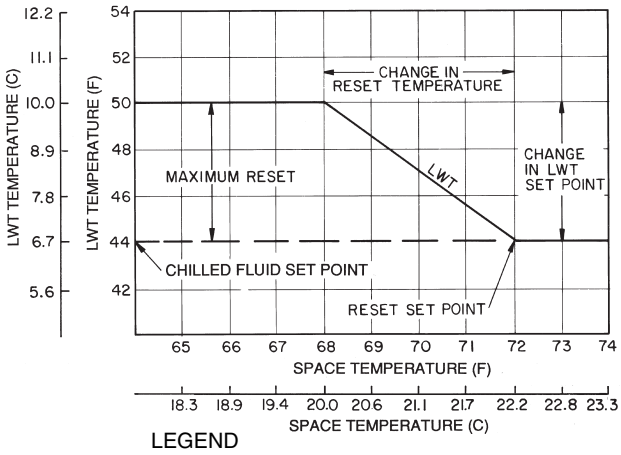
To use demand limit, select the type of demand limiting to use. Then configure the demand limit set points based on the type selected.




LEGEND

**LWT —** Leaving Water (Fluid) Temperature

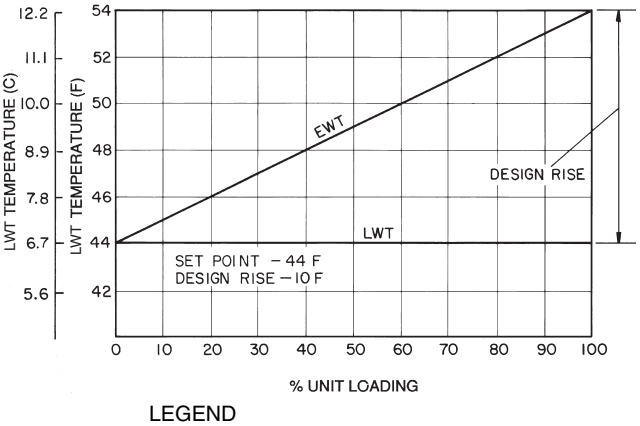
**Fig. 15 — Outdoor-Air Temperature Reset**




LEGEND

**LWT —** Leaving Water (Fluid) Temperature

**Fig. 16 — Space Temperature Reset**




LEGEND

**EWT** — Entering Water (Fluid) Temperature
**LWT** — Leaving Water (Fluid) Temperature

**Fig. 17 — Standard Chilled Fluid Temperature Control — No Reset**

DEMAND LIMIT (2-Stage Switch Controlled) — To configure demand limit for 2-stage switch control set the Demand Limit Select (***Configuration→RSET→DMDC***) to 1. Then configure the 2 Demand Limit Switch points (***Configuration→RSET→DLS1***) and (***Configuration→RSET →DLS2***) to the desired capacity limit. See Table 17. Capacity steps are controlled by 2 relay switch inputs field wired to LVT as shown in Fig. 5.

For demand limit by 2-stage switch control, closing the first stage demand limit contact will put the unit on the first demand limit level. The unit will not exceed the percentage of capacity entered as Demand Limit Switch 1 set point (***DLS1***). Closing contacts on the second demand limit switch prevents the unit from exceeding the capacity entered as Demand Limit Switch 2 set point. The demand limit stage that is set to the lowest demand takes priority if both demand limit inputs are closed. If the demand limit percentage does not match unit staging, the unit will limit capacity to the closest capacity stage.

To disable demand limit configure ***DMDC*** to 0. See Table 17.

EXTERNALLY POWERED DEMAND LIMIT (4 to 20 mA Controlled) — To configure demand limit for 4 to 20 mA control set the Demand Limit Select (***Configuration→RSET→DMDC***) to 2. Then configure the Demand Limit at 20 mA (***Configuration→RSET→DM20***) to the maximum loadshed value desired. Connect the output from an externally powered 4 to 20 mA signal to terminal block LVT, terminals 7 and 8 (+,–). Refer to the unit wiring diagram for these connections to the optional/accessory energy management module and terminal block. The control will reduce allowable capacity to this level for the 20 mA signal. See Table 17 and Fig. 18.

**⚠ CAUTION**

Care should be taken when interfacing with other manufacturer's control systems, due to possible power supply differences, full wave bridge versus half wave rectification. The two different power supplies cannot be mixed. *Comfort*Link controls use half wave rectification. A signal isolation device should be utilized if a full wave bridge signal generating device is used.

DEMAND LIMIT (CCN Loadshed Controlled) — To configure Demand Limit for CCN Loadshed control set the Demand Limit Select (***Configuration→RSET→DMDC***) to 3. Then configure the Loadshed Group Number (***Configuration→RSET→SHNM***), Loadshed Demand Delta (***Configuration→RSET→SHDL***), and Maximum Loadshed Time (***Configuration→RSET→SHTM***). See Table 17.

The Loadshed Group number is established by the CCN system designer. The *Comfort*Link controls will respond to a Redline command from the Loadshed control. When the Redline command is received, the current stage of capacity is set to the maximum stages available. Should the loadshed control send a Loadshed command, the *Comfort*Link controls will reduce the current stages by the value entered for Loadshed Demand delta. The Maximum Loadshed Time is the maximum length of time that a loadshed condition is allowed to exist. The control will disable the Redline/Loadshed command if no Cancel command has been received within the configured maximum loadshed time limit.

**Cooling Set Point (4 to 20 mA) —** A field supplied and generated, externally powered 4 to 20 mA signal can be used to provide the leaving fluid temperature set point. Connect the signal to LVT-10,8 (+,–). See Table 17 for instructions to enable the function. Figure 19 shows how the 4 to 20 mA signal is linearly calculated on an overall 10 F to 80 F range for fluid types (***Configuration→OPT1→FLUD***) 1 or 2. The set point will be limited by the fluid (***FLUD***) type. Be sure that the chilled water loop is protected at the lowest temperature.

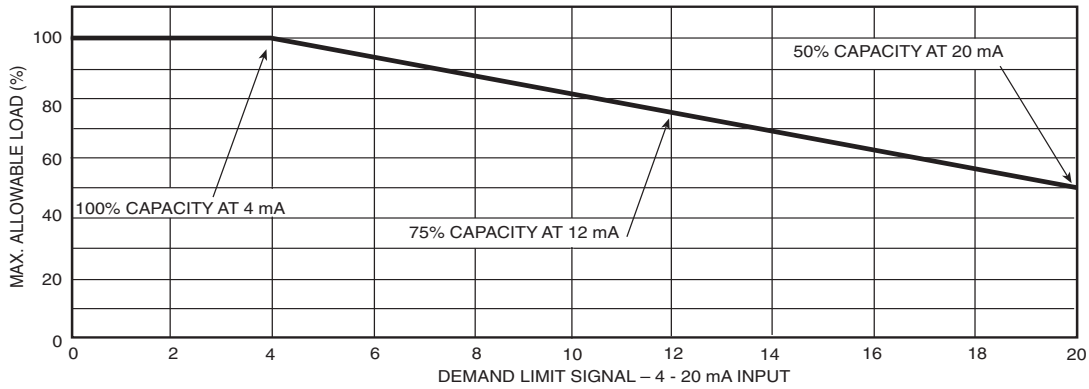
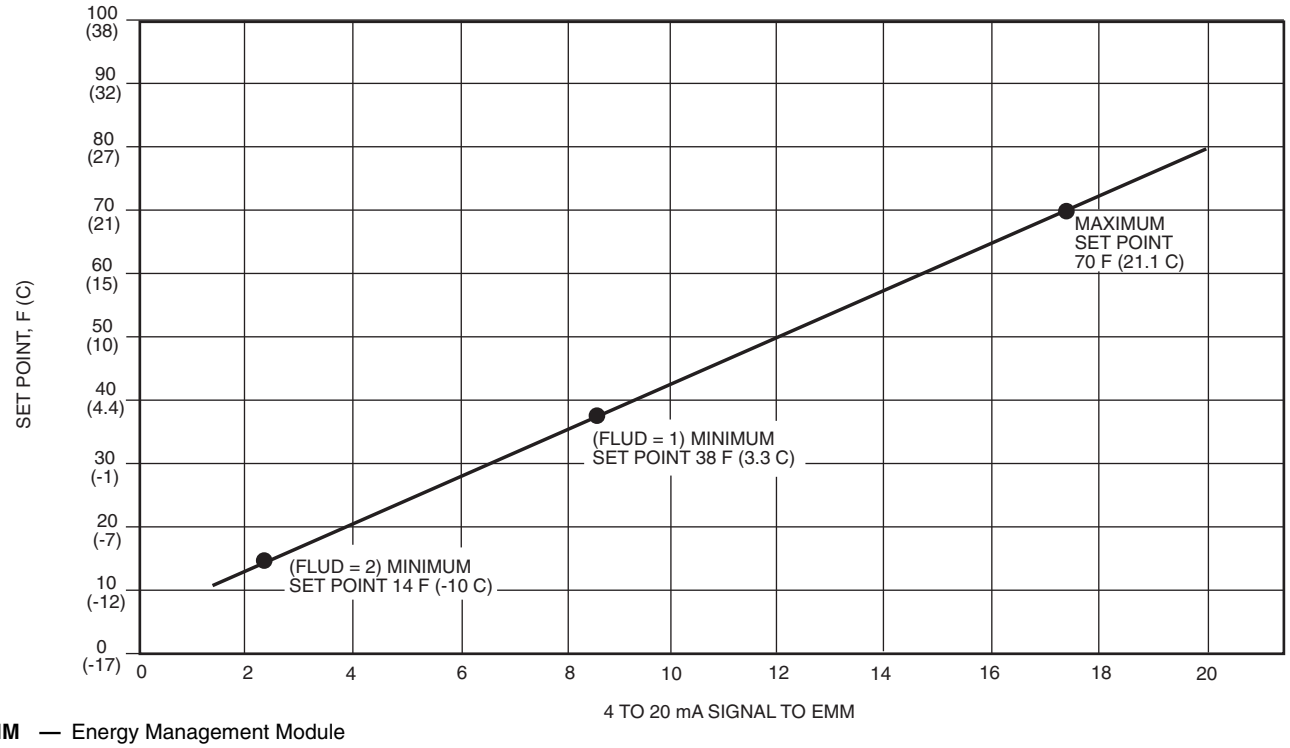



**Fig. 18 — 4 to 20-mA Demand Limiting**




**EMM** — Energy Management Module

**Fig. 19 — Cooling Set Point (4 to 20 mA)**

**Table 17 — Configuring Demand Limit**

| MODE | KEYPAD ENTRY | SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|
| CONFIGURATION | ENTER | DISP | ENTER | TEST | ON/OFF | Test Display LEDs | |
| | ▼ | UNIT | ENTER | TYPE | X | Unit Type | |
| | ▼ | OPT1 | ENTER | FLUD | X | Cooler Fluid | |
| | ▼ | OPT2 | ENTER | CTRL | X | Control Method | |
| | ▼ | CCN | ENTER | CCNA | X | CCN Address | |
| | ▼ | RSET | ENTER | CRST | X | Cooling Reset Type | |
| | | | ▼ | DMDC* | X | Demand Limit Select | Default: 0<br>0 = None<br>1 = Switch<br>2 = 4 to 20 mA Input<br>3 = CCN Loadshed |
| | | | ▼ | DM20 | XXX % | Demand Limit at 20 mA | Default: 100%<br>Range: 0 to 100 |
| | | | ▼ | SHNM | XXX | Loadshed Group Number | Default: 0<br>Range: 0 to 99 |
| | | | ▼ | SHDL | XXX% | Loadshed Demand Delta | Default: 0%<br>Range: 0 to 60% |
| | | | ▼ | SHTM | XXX MIN | Maximum Loadshed Time | Default: 60 min.<br>Range: 0 to 120 min. |
| | | | ▼ | DLS1 | XXX % | Demand Limit Switch 1 | Default: 80%<br>Range: 0 to 100% |
| | | | ▼ | DLS2 | XXX % | Demand Limit Switch 2 | Default: 50%<br>Range: 0 to 100% |

*Seven items skipped in this example.

**Digital Scroll Option —** The 30MP015-045 units have a factory-installed option for a digital scroll compressor which provides additional stages of unloading for the unit. The digital compressor is always installed in the A1 compressor location. When a digital compressor is installed, a digital unloader solenoid (DUS) is used on the digital compressor.

DIGITAL SCROLL OPERATION — A digital scroll operates in two stages — the "loaded state" when the solenoid valve is deenergized and the "unloaded state" when the solenoid valve is energized. During the loaded state, the compressor operates like a standard scroll and delivers full capacity and mass flow.

However, during the unloaded state, there is no capacity and no mass flow through the compressor. The capacity of the system is varied by varying the time the compressor operates in an unloaded and loaded state during a 15-second period. If the DUS is energized for 7 seconds, the compressor will be operating at 47% capacity. If the DUS is energized for 10 seconds, the compressor will be operating at approximately 33% of its capacity. Capacity is the time averaged summation of loaded and unloaded states, and its range is continuous from the minimum configured capacity to 100%. Regardless of capacity, the compressor always rotates with constant speed. As the compressor transitions from a loaded to unloaded state, the discharge and suction pressures will fluctuate and the compressor sound will change.

The *Comfort*Link controller controls and integrates the operation of the DUS into the compressor staging routine to maintain temperature control. When a digital compressor is installed, an additional discharge gas temperature thermistor (DTT) is installed along with the AUX board for control of the DUS.

DIGITAL COMPRESSOR CONFIGURATION — When a digital compressor is installed, the configuration parameter (***Configuration→UNIT→A1.TY***) is configured to YES. There is also a maximum unload time configuration, (***Configuration→UNIT→MAX.T***) that is set to 10 seconds (sizes 015,020,030) or 7 seconds (sizes 040,045), which indicates the maximum unloading for the digital compressor is 47%. This is done to optimize efficiency of the system.

## PRE-START-UP

IMPORTANT: Before beginning Pre-Start-Up or Start-Up, complete Start-Up Checklist for 30MP Liquid Chiller at end of this publication (pages CL-1 to CL-7). The checklist assures proper start-up of a unit, and provides a record of unit condition, application requirements, system information, and operation at initial start-up.

Do not attempt to start the chiller until following checks have been completed.

### System Check

1. Check all auxiliary components, such as chilled fluid pumps, air-handling equipment, condenser pump or other equipment to which the chiller supplies liquid. Consult manufacturer's instructions. Verify that any pump interlock contacts have been properly installed. If the unit has field-installed accessories, be sure all are properly installed and wired correctly. Refer to unit wiring diagrams.
2. Use the scrolling marquee display to adjust the Cooling Set Point.
3. Fill chilled fluid circuit with clean water (with recommended inhibitor added) or other non-corrosive fluid to be cooled. Bleed all air out of the high points of the system. If chilled water is to be maintained at a temperature below 40 F (4.4 C), a brine of sufficient concentration must be used to prevent freeze-up at anticipated suction temperatures. To ensure sufficient loop volume, see Tables 18 and 19.
4. Check tightness of all electrical connections.

   NOTE: On units with digital scroll option do not check refrigerant; charge if compressor is operating at less than

100% capacity; digital operation can be disabled by configuring **A1.TY = NO** ***(Configuration→Unit→A1.TY)***.

5. Oil should be visible in the compressor sight glass(es). See Fig. 20. An acceptable oil level in the compressors is from $^1/_8$ to $^3/_8$ of sight glass when the compressors are off. Adjust the oil level as required. See Oil Charge section on page 30 for Carrier approved oils.
6. Crankcase heaters must be firmly attached to compressors, and must be on for 24 hours prior to start-up (30MPA units only).
7. Electrical power source must agree with unit nameplate.
8. Check rotation of scroll compressors. Monitor control alarms during first compressor start-up for reverse rotation protection alarm.

## START-UP AND OPERATION

**⚠ CAUTION**

Crankcase heaters on 30MPA units are wired into the control circuit, so they are always operable as long as the main power supply disconnect is on (closed), even if any safety device is open. Compressor heaters must be on for 24 hours prior to the start-up of any compressor. Equipment damage could result if heaters are not energized for at least 24 hours prior to compressor start-up.

Compressor crankcase heaters must be on for 24 hours before start-up. To energize the crankcase heaters, close the field disconnect. Leave the compressor circuit breakers off/open. The crankcase heaters are now energized.

NOTE: Refer to Start-Up Checklist on pages CL-1 to CL-7.

**Actual Start-Up —** Actual start-up should be done only under supervision of a qualified refrigeration mechanic.

1. Be sure all service valves are open (30MPA units only).
2. Using the scrolling marquee display, set leaving-fluid set point (***Set Points→COOL→CSP.1***). No cooling range adjustment is necessary.
3. Start chilled fluid pump (if not configured for cooler pump control).
4. Turn ENABLE/OFF/REMOTE CONTACT switch to ENABLE position.
5. Allow unit to operate and confirm that everything is functioning properly. Check to see that leaving fluid temperature agrees with leaving set point (***Set Points→COOL →CSP.1***) or (***Set Points→COOL→CSP.2***), or if reset is used, with the control point (***Run Status→VIEW →CTPT***).
6. Check the cooler leaving chilled water temperature to see that it remains well above 32 F (0° C), or the brine freezing point if the unit is a medium temperature brine unit.
7. Recheck compressor oil level (see Oil Charge section).

**Check Refrigerant Charge —** All 30MPW units are shipped with a complete operating charge of R-410A and should be under sufficient pressure to conduct a leak test after installation. If there is no system pressure, admit nitrogen until a pressure is observed and then proceed to test for leaks. After leaks are repaired, the system must be dehydrated.

All refrigerant charging should be done through the ¼-in. Schrader connection on the liquid line. Do NOT add refrigerant charge through the low-pressure side of the system. If complete charging is required, weigh in the appropriate charge for the circuit as shown on the unit nameplate. If partial charging is required, operate circuit at full load and add charge until the sight glass is clear of bubbles.

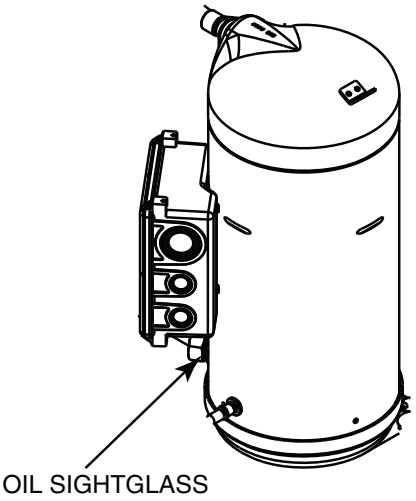



**Fig. 20 — Sight Glass Location**

**Table 18 — Minimum Flow Rates and Minimum Loop Volume — English**

| UNIT SIZE | FLOW RATE | | NORMAL AIR CONDITIONING APPLICATION Gal./Ton | | | PROCESS COOLING OR LOW AMBIENT OPERATION APPLICATION Gal./Ton | | |
|---|---|---|---|---|---|---|---|---|
| | EVAPORATOR | CONDENSER | | | | | | |
| | Gal./Min | Gal./Min | Std Unit | HGBP | Digital | Std Unit | HGBP | Digital |
| 30MP015 | 22 | 22 | 12 | N/A | 3 | 12 | N/A | 6 |
| 30MP020 | 28 | 28 | 6 | 4 | 3 | 10 | 10 | 6 |
| 30MP030 | 43 | 43 | 6 | 4 | 3 | 10 | 10 | 6 |
| 30MP040 | 55 | 55 | 3 | 3 | 3 | 6 | 6 | 6 |
| 30MP045 | 64 | 64 | 3 | 3 | 3 | 6 | 6 | 6 |

**Table 19 — Minimum Flow Rates and Minimum Loop Volume — SI**

| UNIT SIZE | FLOW RATE | | NORMAL AIR CONDITIONING APPLICATION L per kW | | | PROCESS COOLING OR LOW AMBIENT OPERATION APPLICATION L per kW | | |
|---|---|---|---|---|---|---|---|---|
| | EVAPORATOR | CONDENSER | | | | | | |
| | L/s | L/s | Std Unit | HGBP | Digital | Std Unit | HGBP | Digital |
| 30MP015 | 1.4 | 1.4 | 13.0 | N/A | 3.3 | 13.0 | N/A | 6.5 |
| 30MP020 | 1.8 | 1.8 | 6.5 | 4.3 | 3.3 | 10.8 | 10.8 | 6.5 |
| 30MP030 | 2.7 | 2.7 | 6.5 | 4.3 | 3.3 | 10.8 | 10.8 | 6.5 |
| 30MP040 | 3.5 | 3.5 | 3.3 | 3.3 | 3.3 | 6.5 | 6.5 | 6.5 |
| 30MP045 | 4.0 | 4.0 | 3.3 | 3.3 | 3.3 | 6.5 | 6.5 | 6.5 |

LEGEND
**HGBP** — Hot Gas Bypass

**⚠ CAUTION**

Never charge liquid into low-pressure side of system. Do not overcharge. Overcharging results in higher discharge pressure, possible compressor damage, and higher power consumption. During charging or removal of refrigerant, be sure water is continuously circulating through the cooler to prevent freezing.

The 30MPA units (condenserless) are shipped with a nitrogen holding charge only. After chiller assembly is completed in the field, system must be fully charged. While the unit is running at full capacity, add refrigerant until the sight glass is clear. R-410A is the required refrigerant.

Do not open the liquid valve until there is a charge in remainder of system. *A positive pressure indicates a charge in system*. With the unit operating at **full load**, check liquid line sight glass to be sure the unit is fully charged (bubbles in the sight glass indicate the unit is **not** fully charged).

If there is no refrigerant vapor pressure in the system, the entire system must be leak tested. After repairing leaks, evacuate the system before recharging.

Follow approved evacuation procedures when removing refrigeration. Release remaining pressure to an approved evacuated cylinder.

The liquid charging method is recommended for complete charging or when additional charge is required.

**⚠ CAUTION**

Be careful not to overcharge the system. Overcharging results in higher discharge pressure, possible compressor damage, and higher power consumption.

EVACUATION AND DEHYDRATION — Because the 30MP systems use polyol ester (POE) oil, which can absorb moisture, it is important to minimize the amount of time that the system interior is left exposed to the atmosphere. Minimizing the exposure time of the oil to the atmosphere will minimize the amount of moisture that needs to be removed during evacuation.

Once all of the piping connections are complete, leak test the unit and then pull a deep dehydration vacuum. Connect the vacuum pump to the high flow Schraeder valve in the suction line and liquid line. For best results, it is recommended that a vacuum of at least 500 microns (0.5 mm Hg) be obtained. Afterwards, to ensure that no moisture is present in the system, perform a standing vacuum-rise test.

With the unit in deep vacuum (500 microns or less), isolate the vacuum pump from the system. Observe the rate-of-rise of the vacuum in the system. If the vacuum rises by more than 50 microns in a 30-minute time period, then continue the dehydration process. Maintain a vacuum on the system until the standing vacuum requirement is met. This will ensure a dry system.

By following these evacuation and dehydration procedures, the amount of moisture present in the system will be minimized. It is required that liquid line filter driers be installed between the condenser(s) and the expansion devices to capture any foreign debris and provide additional moisture removal capacity.

LIQUID CHARGING METHOD — Add charge to the unit through the liquid line service valve. **Never charge liquid into the low-pressure side of the system**.

1. Close liquid line ball valve (30MPA only).
2. Connect a refrigerant cylinder loosely to the high flow Schrader valve connection on the liquid line. Purge the charging hose and tighten the connections.
3. Open the refrigerant cylinder valve.
4. If the system has been dehydrated and is under vacuum, break the vacuum with refrigerant gas. For R-410A, build up system pressure to 101 psig and 32 F (697 kPa and 0° C). Invert the refrigerant cylinder so that the liquid refrigerant will be charged.
5. a. For complete charge of 30MPW units, follow charging by weight procedure. When charge is nearly full, complete the process by observing the sight glass for clear liquid flow while the unit is operating. *The use of sight glass charging is valid only when unit is operating at full capacity.*

   b. For complete charge of 30MPA units or where refrigerant cylinder cannot be weighed, follow the condenser manufacturer's charging procedure or follow charging by sight glass procedure. *The use of sight glass charging is valid only when unit is operating at full capacity.*
6. a. The 30MPA condenserless units are shipped with a nitrogen holding charge. After installation with the field-supplied system high side, the complete system should be evacuated and charged per the condenser manufacturer's charging procedure or charged until the sight glass is clear (with the unit running at full capacity). To achieve maximum system capacity, add additional charge equal to the difference between the condenser optimal charge and the condenser minimum charge, which can be obtained from the charge data provided in the condenser installation instructions.

   b. To ensure maximum performance of 30MPW units, raise the compressor saturated discharge temperature (SDT) to approximately 100 F (37.8 C) by throttling the condenser water intake. Add charge until there is approximately 9 to 12° F (5.0 to 6.6° C) of system subcooling (SDT minus actual temperature entering the thermostatic expansion valve).

## Operating Limitations

TEMPERATURES (See Table 20 for 30MP standard temperature limits).

**⚠ CAUTION**

Do not operate with cooler leaving chiller water (fluid) temperature (LCWT) below 32 F (0° C) for standard units with proper brine solution or 40 F (4.4 C) for the standard units with fresh water, or below 15 F (–9.4 C) for units factory built for medium temperature brine or unit damage may occur.

High Cooler Leaving Chilled Water (Fluid) Temperatures (LCWT) — During start-up with cooler the LCWT should not be above approximately 60 F (16 C).

Low Cooler LCWT — For standard units with fresh water, the LCWT must be no lower than 40 F (4.4 C). For standard units with a proper brine solution, the LCWT must be no lower than 32 F (0° C). If the unit is the factory-installed optional medium temperature brine unit, the cooler LCWT can go down to 15 F (–9.4 C).

**Table 20 — Temperature Limits for Standard 30MP Units**

| TEMPERATURE LIMIT | F | C |
|---|---|---|
| Maximum Condenser LWT | 140 | 60 |
| Minimum Condenser EWT | 65 | 18 |
| Maximum Cooler EWT* | 95 | 35 |
| Maximum Cooler LWT | 70 | 21 |
| Minimum Cooler LWT† | 40 | 4 |

LEGEND

**EWT** — Entering Fluid (Water) Temperature
**LWT** — Leaving Fluid (Water) Temperature

*For sustained operation, EWT should not exceed 85 F (29.4 C).
†Unit requires modification below this temperature.

IMPORTANT: Medium temperature brine duty application (below 32 F [0° C] LCWT) for chiller normally requires factory modification. Contact your Carrier representative for applicable LCWT range for standard water-cooled chiller in a specific application.

VOLTAGE — ALL UNITS

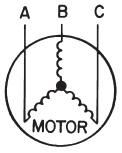
Main Power Supply — Minimum and maximum acceptable supply voltages are listed in the Installation Instructions.

*Unbalanced 3-Phase Supply Voltage — Never operate a motor where a phase imbalance between phases is greater than 2%.* To determine percent voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{\text{max voltage deviation from avg voltage}}{\text{average voltage}}$$

The maximum voltage deviation is the largest difference between a voltage measurement across 2 legs and the average across all 3 legs.

Example: Supply voltage is 240-3-60.




AB = 243 v
BC = 236 v
AC = 238 v

1. Determine average voltage:

$$\text{Average voltage} = \frac{243 + 236 + 238}{3}$$

$$= \frac{717}{3}$$

$$= 239$$

2. Determine maximum deviation from average voltage:
   (AB) 243 – 239 = 4 v
   (BC) 239 – 236 = 3 v
   (AC) 239 – 238 = 1 v
   Maximum deviation is 4 v.
3. Determine percent voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{4}{239}$$

$$= 1.7\%$$

This voltage imbalance is satisfactory as it is below the maximum allowable of 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately. Do not operate unit until imbalance condition is corrected.

Control Circuit Power — Power for the control circuit is supplied from the main incoming power through a factory-installed control power transformer (TRAN1) for all models. Field wiring connections are made to the LVT.

## OPERATION SEQUENCE

The unit is started by putting the ENABLE/OFF/REMOTE CONTACT switch in the ENABLE or REMOTE CONTACT position. When the unit receives a call for cooling (either from the internal control or CCN network command or remote contact closure), the unit stages up in capacity to maintain the leaving fluid set point. The first compressor starts $1^1/_2$ to 3 minutes after the call for cooling.

For all units, if temperature reset is being used, the unit controls to a higher leaving-fluid temperature as the building load reduces. If demand limit is used, the unit may temporarily be unable to maintain the desired leaving-fluid temperature because of imposed power limitations.

## SERVICE

**⚠ WARNING**

Electrical shock can cause personal injury and death. Shut off all power to this equipment during service. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

### Electronic Components

CONTROL COMPONENTS — Unit uses an advanced electronic control system that normally does not require service. For details on controls refer to Controls section.

Access to the controls is through a hinged panel. Inner panels are secured in place and should not be removed unless all power to the chiller is off.

**Compressor Replacement —** All models contain scroll compressors and have two or three compressors. A compressor is most easily removed from the side of the unit or above, depending on where clearance space was allowed during unit installation. See Fig. 21.

Remove the junction box cover bolts and disconnect the compressor power and crankcase heater connections (30MPA only). Remove the cable from the compressor junction box. Remove the connections from the high-pressure switch. Remove the crankcase heater. Knock the same holes out of the new compressor junction box and install the cable connectors from the old compressor.

The compressors are bolted to rails, which are in turn bolted to the unit basepan for all sizes. Remove the 4 bolts holding the compressor to the rail on the basepan. Save the mounting hardware for use with the new compressor. Carefully cut the compressor suction and discharge lines with a tubing cutter as close to the compressor as feasible. Remove high-pressure switch and pressure transducer(s) if required for compressor removal. Lift one corner of the compressor at a time and remove all the steel spacers. Remove the old compressor from the unit.

Slide the new compressor in place on the rails. Lifting one side of the compressor at a time, replace all of the compressor mounting hardware. Using new tubing as required, reconnect compressor suction and discharge lines. Using hardware saved, reinstall the mounting bolts and washers through the compressor feet. Using proper techniques, braze suction and discharge lines and check for leaks. Reconnect oil equalization line.

Re-install the crankcase heater (30MPA units). Reconnect the compressor power connections and high-pressure switch wiring as on the old compressor. Refer to Fig. 21. Following

the installation of the new compressor, tighten all hardware to the following specifications. (See Table 21.)

**Table 21 — Unit Torque Specification**

| FASTENER | RECOMMENDED TORQUE |
|---|---|
| **Compressor Mounting Bolts** | 7 to 10 ft-lb (9.5 to 13.5 N-m) |
| **Compressor Power Connections** | 24 to 28 in.-lb (2.7- to 3.2 N-m) |
| **Compressor Ground Terminal Connections** | 14 to 18 in.-lb (1.6 to 2.0 N-m) |

## 30MPW Condenser and 30MP Cooler

BRAZED-PLATE COOLER AND CONDENSER HEAT EXCHANGER REPLACEMENT — Brazed-plate heat exchangers cannot be repaired if they develop a leak. If a leak (refrigerant or water) develops, the heat exchanger **must be** replaced. To replace a brazed plate heat exchanger:

1. Disconnect the liquid-in and liquid-out connections at the heat exchanger.
2. Check that the replacement heat exchanger is the same as the original heat exchanger. For the condensers, compare part numbers on the heat exchangers. For the coolers, insulation covers the manufacturer's part number. Make sure the depths of the replacement and original cooler heat exchangers are the same.
3. Recover the refrigerant from the system, and unsolder the refrigerant-in and refrigerant-out connections.
4. Remove the four nuts holding the heat exchanger to the brackets. Save the nuts.
5. Install the replacement heat exchanger in the unit and attach to the bracket using the four nuts removed in Step 4. For sizes 015 and 020, torque is 7-10 ft-lb. For sizes 030-045, torque is 35 to 50 ft-lb.
6. *Carefully* braze the refrigerant lines to the connections on the heat exchanger. Lines should be soldered using silver as the soldering material with a minimum of 45% silver. Keep the temperature below 1472 F (800 C) under normal soldering conditions (no vacuum) to prevent the copper solder of the brazed plate heat exchanger from changing its structure. Failure to do so can result in internal or external leakage at the connections which cannot be repaired.
7. For coolers, ensure that the original size tubing is used ($^1/_2$-in. for sizes 015 and 020 and $^5/_8$-in. for sizes 030-045) between the TXV and the cooler. The TXV must be located within 1 ft of the heat exchanger, with no bends between the TXV outlet and the cooler inlet.
8. Reconnect the water/brine lines.
9. Dehydrate and recharge the unit. Check for leaks.

BRAZED-PLATE COOLER AND CONDENSER HEAT EXCHANGER CLEANING — Brazed-plate heat exchangers must be cleaned chemically. A professional cleaning service skilled in chemical cleaning should be used. Use a weak acid (5% phosphoric acid, or if the heat exchanger is cleaned frequently, 5% oxalic acid). Pump the cleaning solution through the exchanger, preferably in a backflush mode. After cleaning, rinse with large amounts of fresh water to dispose of all the acid. Cleaning materials must be disposed of properly.

The strainers in front of the water/brine inlets of the heat exchangers should be cleaned periodically, depending on condition of the chiller water/brine.

## Oil Charge

**⚠ CAUTION**

The compressor in a Puron® refigerant (R-410A) system uses a polyol ester (POE) oil. This is extremely hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Take all necessary precautions to avoid exposure of the oil to the atmosphere. Failure to do so could result in possible equipment damage.

Puron refrigerant systems use a polyol ester (POE) oil. Use only Carrier approved compressor oil. Oil should be visible in compressor oil sight glass. An acceptable oil level is from $^1/_8$ to $^3/_8$ of sight glass. All compressors must be off when checking oil level. Recommended oil level adjustment method is as follows:

ADD OIL — Additional oil may be required in 30MPA units. Tables 22 and 23 provide an estimate of the amount of oil required, based on the line length and the recommended pipe sizes. The actual circuit oil charge will depend on the application piping. The guidelines listed are estimates and will likely need adjusting depending on the number of traps in the application and the pipe sizes utilized.

No attempt should be made to increase the oil level in the sight-glass above the $^3/_4$ full level. A high oil level is not sustainable in the compressor and the extra oil will be pumped out into the system causing a reduction in system efficiency and a higher-than-normal oil circulation rate.

Add oil to suction line Schrader valve on tandem compressors sets and the compressor Schrader on the trios. When oil can be seen at the bottom of the sight glass, add oil in 5 oz increments which is approximately $^1/_8$ in oil level. Run all compressors for 20 minutes then shut off to check oil level. Repeat procedure until acceptable oil level is present.

NOTE: Use only Carrier approved compressor oil. Approved sources are:

Totaline . . . . . 3MAF POE, P903-1601
Mobil . . . . . .EAL Arctic 32-3MA
Uniqema . . . . . RL32-3MAF

Do not reuse oil that has been drained out, or oil that has been exposed to atmosphere.

## Check Refrigerant Feed Components

FILTER DRIER — The function of the filter drier is to maintain a clean, dry system. The moisture indicator (described below) indicates any need to change the filter drier. The filter drier is a sealed-type drier. When the drier needs to be changed, the entire filter drier must be replaced.

MOISTURE-LIQUID INDICATOR — The indicator is located immediately ahead of the TXV to provide an indication of the refrigerant moisture content. It also provides a sight glass for refrigerant liquid. Clear flow of liquid refrigerant (*at full unit loading*) indicates sufficient charge in the system. Bubbles in the sight glass (*at full unit loading*) indicate an undercharged system or the presence of noncondensables. Moisture in the system, measured in parts per million (ppm), changes the color of the indicator as follows:

Green (safe) —Moisture is below 75 ppm
Yellow-Green (caution) — 75 to 150 ppm
Yellow (wet) — above 150 ppm

The unit must be in operation at least 12 hours before the moisture indicator gives an accurate reading, and must be in contact with *liquid* refrigerant. At the first sign of moisture in the system, change the corresponding filter drier.

THERMOSTATIC EXPANSION VALVE (TXV) — The TXV controls the flow of liquid refrigerant to the cooler by maintaining constant superheat of vapor leaving the cooler. The valve is activated by a temperature-sensing bulb strapped to the suction line.

The valve(s) is factory-set to maintain between 8° and 10° F (4.4° and 5.6° C) of superheat leaving the cooler. Check the superheat during operation after conditions have stabilized. If necessary, adjust the superheat to prevent refrigerant floodback to the compressor.

**Table 22 — Additional Lubrication Recommendation — English**

| 30MPA UNIT SIZE | CONDENSER 09DP | ADDITIONAL LUBRICANT (FLUID OUNCES) REQUIRED BASED ON ACTUAL REFRIGERANT LINE LENGTH | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | UP TO 25 ft | 25-50 ft | 50-75 ft | 75-100 ft | 100-125 ft | 125-150 ft | 150-175 ft | 175-200 ft |
| 15 | S018 | 0 | 9 | 11 | 12 | 13 | 14 | 15 | 16 |
| 20 | S020 | 11 | 12 | 13 | 14 | 21 | 23 | 26 | 28 |
| 30 | S030 | 13 | 15 | 17 | 20 | 22 | 24 | 27 | 29 |
| 40 | M040 | 27 | 30 | 33 | 36 | 51 | 57 | 63 | 68 |
| 45 | M050 | 27 | 30 | 33 | 37 | 52 | 57 | 63 | 69 |

NOTE: This chart is based on recommended pipe sizes.

**Table 23 — Additional Lubrication Recommendation — SI**

| 30MPA UNIT SIZE | CONDENSER 09DP | ADDITIONAL LUBRICANT (FLUID OUNCES) REQUIRED BASED ON ACTUAL REFRIGERANT LINE LENGTH | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | UP TO 7.5 M | 7.5-15 M | 15-22.5 M | 22.5-30 M | 30-37.5 M | 37.5-45 M | 45-52.5 M | 52.5-60 M |
| 15 | S018 | 0 | 262 | 319 | 352 | 384 | 417 | 450 | 482 |
| 20 | S020 | 315 | 347 | 380 | 413 | 620 | 688 | 756 | 823 |
| 30 | S030 | 372 | 440 | 508 | 575 | 643 | 710 | 778 | 846 |
| 40 | M040 | 784 | 881 | 977 | 1074 | 1511 | 1676 | 1841 | 2005 |
| 45 | M050 | 791 | 888 | 984 | 1081 | 1518 | 1683 | 1848 | 2012 |

NOTE: This chart is based on recommended pipe sizes.

LEGEND

**CWFS** — Chilled Water Flow Switch
**DPT** — Discharge Pressure Transducer
**EWT** — Entering Water Thermistor
**HPS** — High Pressure Switch
**LWT** — Leaving Water Thermistor
**RGT** — Return Gas Thermistor (Optional)
**SPT** — Suction Pressure Transducer

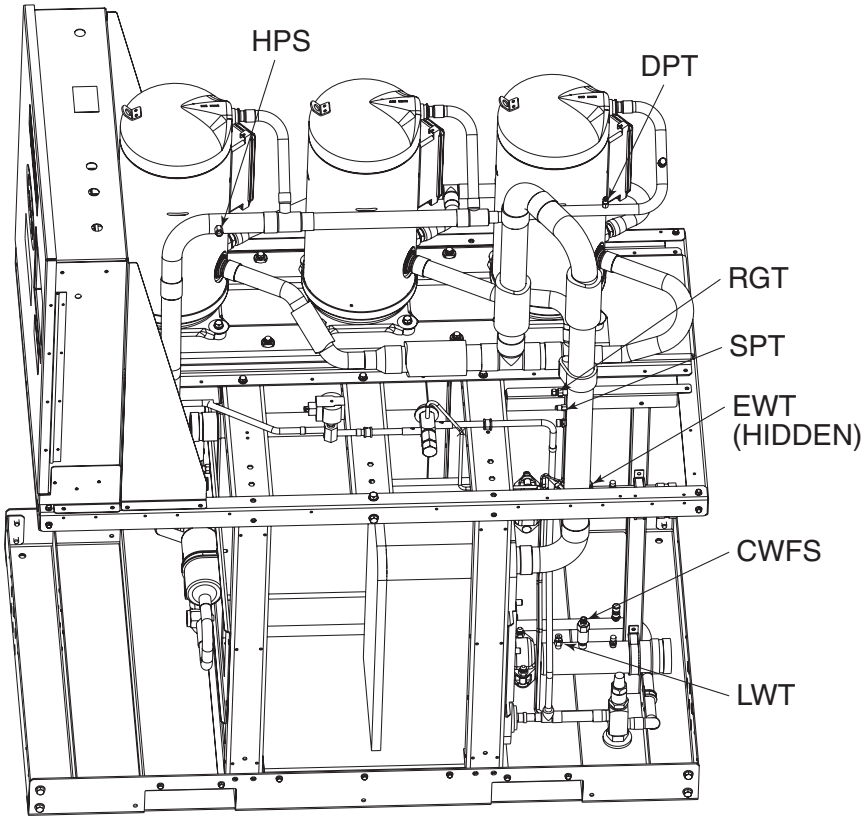



**Fig. 21 — Compressor Location — 30MP015-045 Units (30MPW045 Unit Shown)**

MINIMUM LOAD VALVE — On units equipped with the factory-installed hot gas bypass option, a solenoid valve and discharge bypass valve (minimum load valve) are located between the discharge line and the cooler entering-refrigerant line. The MBB cycles the solenoid to perform minimum load valve function and the discharge bypass valve modulates to the suction pressure set point of the valve. The bypass valve has an adjustable opening setting between 95 to 115 psig (655 to 793 kPa). The factory setting is 105 psig (724 kPa). Refer to cooler pump sequence of operation.

The amount of capacity reduction achieved by the minimum load valve is not adjustable. The total unit capacity with the minimum load valve is shown in Table 9.

PRESSURE RELIEF DEVICES — All units have one pressure relief device per circuit located in the liquid line which relieves at 210 F (100 C).

The 30MPW unit does not have a condenser pressure relief valve because the brazed-plate condenser is not considered a pressure vessel, as defined in ANSI/ASHRAE 15 (American National Standards Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers) safety code requirements.

For 30MPA condenserless units, pressure relief devices designed to relieve at the pressure determined in local codes, must be field-supplied and installed in the discharge line piping in accordance with ANSI/ASHRAE 15 safety code requirements. Additional pressure relief valves, properly selected, must be field-supplied and installed to protect high side equipment and may be required by applicable codes.

Most codes require that a relief valve be vented directly to the outdoors. *The vent line must not be smaller than the relief valve outlet.* Consult ANSI/ASHRAE 15 for detailed information concerning layout and sizing of relief vent lines.

## Check Unit Safeties

HIGH-PRESSURE SWITCH — A high-pressure switch is provided to protect the circuit and refrigeration system from unsafe high pressure conditions. See Table 24 for high-pressure switch settings.

The high-pressure switch is mounted in the discharge line of the circuit. If an unsafe, high-pressure condition should exist, the switch opens and shuts off the unit. The MBB senses the HPS feedback signal and generates an appropriate alarm. The MBB prevents the circuit from restarting until the alert condition is reset. The switch should open at the pressure corresponding to the appropriate switch setting as shown in Table 24.

**Table 24 — Factory Settings, High-Pressure Switch (Fixed)**

| UNIT | CUTOUT | | CUT-IN | |
|---|---|---|---|---|
| | Psig | kPa | Psig | kPa |
| 30MP015-045 | 650 | 4482 | 500 | 3447 |

Clear the alarm using the scrolling marquee display. The unit should restart after the compressor anti-short-cycle delay, built into the unit control module, expires.

PRESSURE TRANSDUCERS — Each unit is equipped with a suction and discharge pressure transducer. These inputs to the MBB are not only used to monitor the status of the unit, but to also maintain operation of the chiller within the compressor manufacturer's specified limits. The input to the MBB from the suction pressure transducer is also used to protect the compressor from operating at low pressure conditions. If suction return gas thermistors are installed, then additional low superheat conditions are detected. In some cases, the unit may not be able to run at full capacity. The control module will automatically reduce the capacity of a circuit as needed to maintain specified maximum/minimum operating pressures.

COOLER FREEZE-UP PROTECTION

**⚠ WARNING**

On medium temperature brine units, the anti-freeze solution must be properly mixed to prevent freezing at a temperature of at least 15 F (8.3 C) below the leaving-fluid temperature set point. Failure to provide the proper anti-freeze solution mixture is considered abuse and may impair or otherwise negatively impact the Carrier warranty.

The main base board (MBB) monitors cooler leaving fluid temperature at all times. The MBB will rapidly remove stages of capacity as necessary to prevent freezing conditions due to the rapid loss of load or low cooler fluid flow.

When the cooler is exposed to lower temperatures (40 F [4.4 C] or below), freeze-up protection is required using inhibited ethylene or propylene glycol.

**Thermistors —** Electronic control uses up to five 5,000 ohms thermistors to sense temperatures used to control operation of the chiller. Thermistors EWT, LWT, RGTA, CNDE, CNDL, and OAT are identical in their temperature and voltage drop performance. The SPT space temperature thermistor has a 10,000 ohms input channel and it has a different set of temperature vs. resistance and voltage drop performance. Resistance at various temperatures are listed in Tables 25-29. For dual chiller operation, a dual chiller sensor is required which is a 5,000 ohms thermistor.

REPLACING THERMISTORS (EWT, LWT, RGT, CNDE, CNDL) — Add a small amount of thermal conductive grease to the thermistor well and end of probe. For all probes, tighten the retaining nut ¼ turn past finger tight. See Fig. 22.

THERMISTOR/TEMPERATURE SENSOR CHECK — A high quality digital volt-ohmmeter is required to perform this check.

1. Connect the digital voltmeter across the appropriate thermistor terminals at the J8 terminal strip on the main base board (see Fig. 23).
2. Using the voltage reading obtained, read the sensor temperature from Tables 25-29.
3. To check thermistor accuracy, measure temperature at probe location with an accurate thermocouple-type temperature measuring instrument. Insulate thermocouple to avoid ambient temperatures from influencing reading. Temperature measured by thermocouple and temperature determined from thermistor voltage reading should be close, ± 5° F (3° C) if care was taken in applying thermocouple and taking readings.

If a more accurate check is required, unit must be shut down and thermistor removed and checked at a known temperature (freezing point or boiling point of water) using either voltage drop measured across thermistor at the J8 terminal, by determining the resistance with chiller shut down and thermistor disconnected from J8. Compare the values determined with the value read by the control in the Temperatures mode using the scrolling marquee display.

**Pressure Transducers —** The suction and discharge transducers are different part numbers and can be distinguished by the color of the transducer body, suction (yellow) and discharge (red). No pressure transducer calibration is required. The transducers operate on a 5 vdc supply, which is generated by the main base board (MBB). See Fig. 23 for transducer connections to the J8 connector on the MBB.

TROUBLESHOOTING — If a transducer is suspected of being faulty, first check supply voltage to the transducer. Supply voltage should be 5 vdc ± 0.2 v. If supply voltage is correct, compare pressure reading displayed on the scrolling marquee display module against pressure shown on a calibrated pressure

gauge. Pressure readings should be within ± 15 psig. If the two readings are not reasonably close, replace the pressure transducer.

**Chilled Water Flow Switch —** A factory-installed flow switch is installed in the leaving fluid piping for all units. This is a thermal-dispersion flow switch with no field adjustments. The switch is set for approximately 0.5 ft/sec of flow. The sensor tip houses two thermistors and a heater element. One thermistor is located in the sensor tip, closest to the flowing fluid. See Fig. 24. This thermistor is used to detect changes in the flow velocity of the liquid. The second thermistor is bonded to the cylindrical wall and is affected only by changes in the temperature of the liquid. The thermistors are positioned to be in close contact with the wall of the sensor probe and, at the same time, to be kept separated from each other within the confines of the probe.

In order to sense flow, it is necessary to heat one of the thermistors in the probe. When power is applied, the tip of the probe is heated. As the fluid starts to flow, heat will be carried away from the sensor tip. Cooling of the first thermistor is a function of how fast heat is conducted away by the flowing liquid.

The difference in temperature between the two thermistors provides a measurement of fluid velocity past the sensor probe. When fluid velocity is high, more heat will be carried away from the heated thermistor and the temperature differential will be small. As fluid velocity decreases, less heat will be taken from the heated thermistor and there will be an increase in temperature differential.

When unit flow rate is above the minimum flow rate, then the output is switched on, sending 24 vac to the MBB to prove flow has been established.

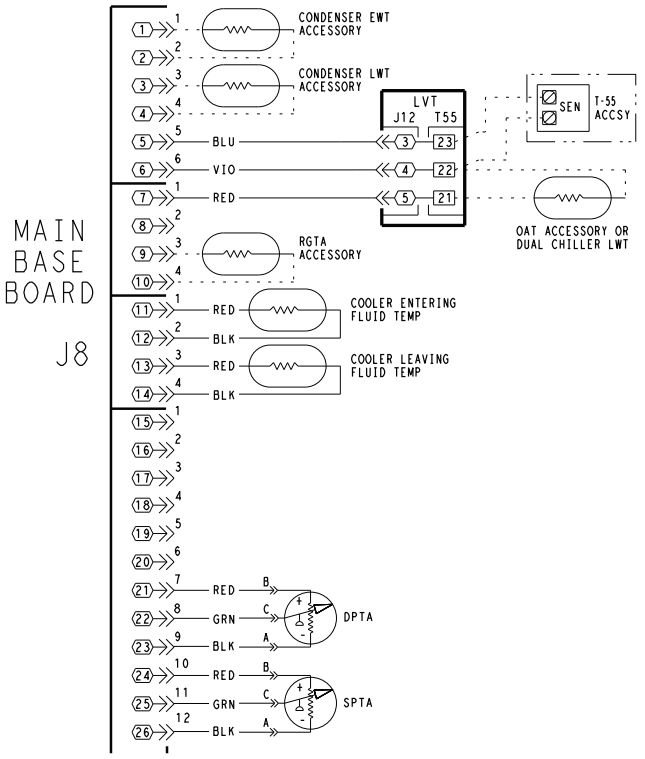
For recommended maintenance, check the flow switch operation. If operation is erratic check the sensor tip for build-up every 6 months. Clean the tip with a soft cloth. If necessary, build-up (e.g., lime) can be removed with a common vinegar cleansing agent.

The flow sensor cable is provided with (3) LEDs that indicate if 24 vac power is present and also status of the switch contacts. The LEDs are as follows:

- Green LED ON – 24 vac present
- One Yellow LED ON – Flow sensor switch OPEN
- Two Yellow LED ON – Flow sensor switch CLOSED

If nuisance trips of the sensor are occurring, follow the steps below to correct the situation:

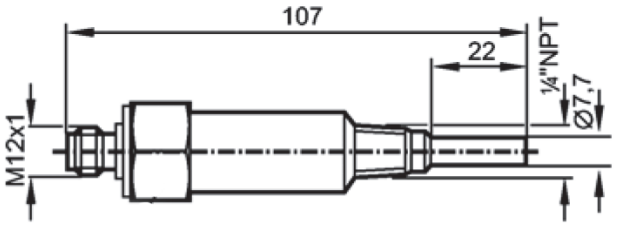
1. Check to confirm that the field-installed strainer is clean. Use the blow-down valve provided or remove the screen and clean it. For the case of VFD controlled pumps, ensure that the minimum speed setting has not been changed.
2. Measure the pressure drop across the cooler and compare this to the system requirements.
3. Verify that cable connections at the switch and at the terminal block are secure.
4. Wrong pump motor rotation. Pump must rotate clockwise when viewed from motor end of pump.




LEGEND

| | | |
|---|---|---|
| **ACCSY** | — | Accessory |
| **DPT** | — | Discharge Pressure Transducer |
| **EWT** | — | Entering Water Temperature |
| **LWT** | — | Leaving Water Temperature Sensor |
| **LVT** | — | Low Voltage Terminal |
| **OAT** | — | Outdoor Air Temperature Sensor |
| **RGT** | — | Return Gas Temperature Sensor |
| **SEN** | — | Sensor Terminal Block |
| **SPT** | — | Space Temperature Sensor |

**Fig. 23 — Thermistor Connections to Main Base Board, J8 Connector**




NOTE: Dimensions are in millimeters.

**Fig. 24 — Chilled Water Flow Switch**

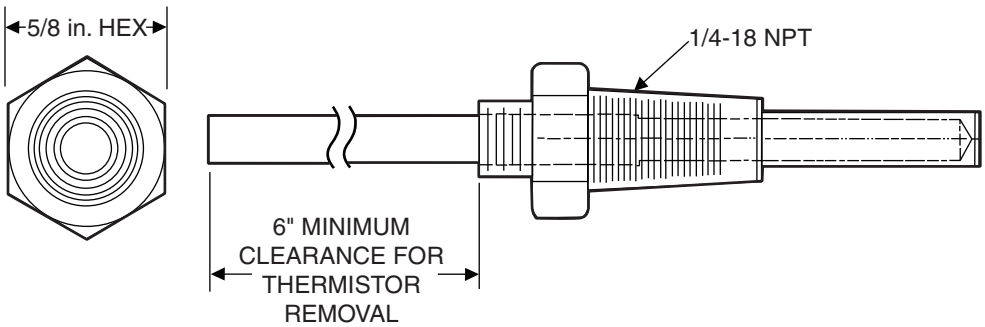



**Fig. 22 — Thermistor Well**

## Table 25 — 5K Thermistor Temperatures (°F) vs. Resistance/Voltage Drop (Voltage Drop for EWT, LWT, RGT, CNDE, CNDL, Dual Chiller, and OAT)

| TEMP (F) | VOLTAGE DROP (V) | RESISTANCE (Ohms) |
|---|---|---|
| **–25** | 3.699 | 98,010 |
| **–24** | 3.689 | 94,707 |
| **–23** | 3.679 | 91,522 |
| **–22** | 3.668 | 88,449 |
| **–21** | 3.658 | 85,486 |
| **–20** | 3.647 | 82,627 |
| **–19** | 3.636 | 79,871 |
| **–18** | 3.624 | 77,212 |
| **–17** | 3.613 | 74,648 |
| **–16** | 3.601 | 72,175 |
| **–15** | 3.588 | 69,790 |
| **–14** | 3.576 | 67,490 |
| **–13** | 3.563 | 65,272 |
| **–12** | 3.550 | 63,133 |
| **–11** | 3.536 | 61,070 |
| **–10** | 3.523 | 59,081 |
| **–9** | 3.509 | 57,162 |
| **–8** | 3.494 | 55,311 |
| **–7** | 3.480 | 53,526 |
| **–6** | 3.465 | 51,804 |
| **–5** | 3.450 | 50,143 |
| **–4** | 3.434 | 48,541 |
| **–3** | 3.418 | 46,996 |
| **–2** | 3.402 | 45,505 |
| **–1** | 3.386 | 44,066 |
| **0** | 3.369 | 42,679 |
| **1** | 3.352 | 41,339 |
| **2** | 3.335 | 40,047 |
| **3** | 3.317 | 38,800 |
| **4** | 3.299 | 37,596 |
| **5** | 3.281 | 36,435 |
| **6** | 3.262 | 35,313 |
| **7** | 3.243 | 34,231 |
| **8** | 3.224 | 33,185 |
| **9** | 3.205 | 32,176 |
| **10** | 3.185 | 31,202 |
| **11** | 3.165 | 30,260 |
| **12** | 3.145 | 29,351 |
| **13** | 3.124 | 28,473 |
| **14** | 3.103 | 27,624 |
| **15** | 3.082 | 26,804 |
| **16** | 3.060 | 26,011 |
| **17** | 3.038 | 25,245 |
| **18** | 3.016 | 24,505 |
| **19** | 2.994 | 23,789 |
| **20** | 2.972 | 23,096 |
| **21** | 2.949 | 22,427 |
| **22** | 2.926 | 21,779 |
| **23** | 2.903 | 21,153 |
| **24** | 2.879 | 20,547 |
| **25** | 2.856 | 19,960 |
| **26** | 2.832 | 19,393 |
| **27** | 2.808 | 18,843 |
| **28** | 2.784 | 18,311 |
| **29** | 2.759 | 17,796 |
| **30** | 2.735 | 17,297 |
| **31** | 2.710 | 16,814 |
| **32** | 2.685 | 16,346 |
| **33** | 2.660 | 15,892 |
| **34** | 2.634 | 15,453 |
| **35** | 2.609 | 15,027 |
| **36** | 2.583 | 14,614 |
| **37** | 2.558 | 14,214 |
| **38** | 2.532 | 13,826 |
| **39** | 2.506 | 13,449 |
| **40** | 2.480 | 13,084 |
| **41** | 2.454 | 12,730 |
| **42** | 2.428 | 12,387 |
| **43** | 2.402 | 12,053 |
| **44** | 2.376 | 11,730 |
| **45** | 2.349 | 11,416 |
| **46** | 2.323 | 11,112 |
| **47** | 2.296 | 10,816 |
| **48** | 2.270 | 10,529 |
| **49** | 2.244 | 10,250 |
| **50** | 2.217 | 9,979 |
| **51** | 2.191 | 9,717 |
| **52** | 2.165 | 9,461 |
| **53** | 2.138 | 9,213 |
| **54** | 2.112 | 8,973 |
| **55** | 2.086 | 8,739 |
| **56** | 2.060 | 8,511 |
| **57** | 2.034 | 8,291 |
| **58** | 2.008 | 8,076 |
| **59** | 1.982 | 7,686 |
| **60** | 1.956 | 7,665 |
| **61** | 1.930 | 7,468 |
| **62** | 1.905 | 7,277 |
| **63** | 1.879 | 7,091 |
| **64** | 1.854 | 6,911 |
| **65** | 1.829 | 6,735 |
| **66** | 1.804 | 6,564 |
| **67** | 1.779 | 6,399 |
| **68** | 1.754 | 6,238 |
| **69** | 1.729 | 6,081 |
| **70** | 1.705 | 5,929 |
| **71** | 1.681 | 5,781 |
| **72** | 1.656 | 5,637 |
| **73** | 1.632 | 5,497 |
| **74** | 1.609 | 5,361 |
| **75** | 1.585 | 5,229 |
| **76** | 1.562 | 5,101 |
| **77** | 1.538 | 4,976 |
| **78** | 1.516 | 4,855 |
| **79** | 1.493 | 4,737 |
| **80** | 1.470 | 4,622 |
| **81** | 1.448 | 4,511 |
| **82** | 1.426 | 4,403 |
| **83** | 1.404 | 4,298 |
| **84** | 1.382 | 4,196 |
| **85** | 1.361 | 4,096 |
| **86** | 1.340 | 4,000 |
| **87** | 1.319 | 3,906 |
| **88** | 1.298 | 3,814 |
| **89** | 1.278 | 3,726 |
| **90** | 1.257 | 3,640 |
| **91** | 1.237 | 3,556 |
| **92** | 1.217 | 3,474 |
| **93** | 1.198 | 3,395 |
| **94** | 1.179 | 3,318 |
| **95** | 1.160 | 3,243 |
| **96** | 1.141 | 3,170 |
| **97** | 1.122 | 3,099 |
| **98** | 1.104 | 3,031 |
| **99** | 1.086 | 2,964 |
| **100** | 1.068 | 2,898 |
| **101** | 1.051 | 2,835 |
| **102** | 1.033 | 2,773 |
| **103** | 1.016 | 2,713 |
| **104** | 0.999 | 2,655 |
| **105** | 0.983 | 2,597 |
| **106** | 0.966 | 2,542 |
| **107** | 0.950 | 2,488 |
| **108** | 0.934 | 2,436 |
| **109** | 0.918 | 2,385 |
| **110** | 0.903 | 2,335 |
| **111** | 0.888 | 2,286 |
| **112** | 0.873 | 2,239 |
| **113** | 0.858 | 2,192 |
| **114** | 0.843 | 2,147 |
| **115** | 0.829 | 2,103 |
| **116** | 0.815 | 2,060 |
| **117** | 0.801 | 2,018 |
| **118** | 0.787 | 1,977 |
| **119** | 0.774 | 1,937 |
| **120** | 0.761 | 1,898 |
| **121** | 0.748 | 1,860 |
| **122** | 0.735 | 1,822 |
| **123** | 0.723 | 1,786 |
| **124** | 0.710 | 1,750 |
| **125** | 0.698 | 1,715 |
| **126** | 0.686 | 1,680 |
| **127** | 0.674 | 1,647 |
| **128** | 0.663 | 1,614 |
| **129** | 0.651 | 1,582 |
| **130** | 0.640 | 1,550 |
| **131** | 0.629 | 1,519 |
| **132** | 0.618 | 1,489 |
| **133** | 0.608 | 1,459 |
| **134** | 0.597 | 1,430 |
| **135** | 0.587 | 1,401 |
| **136** | 0.577 | 1,373 |
| **137** | 0.567 | 1,345 |
| **138** | 0.557 | 1,318 |
| **139** | 0.548 | 1,291 |
| **140** | 0.538 | 1,265 |
| **141** | 0.529 | 1,240 |
| **142** | 0.520 | 1,214 |
| **143** | 0.511 | 1,190 |
| **144** | 0.502 | 1,165 |
| **145** | 0.494 | 1,141 |
| **146** | 0.485 | 1,118 |
| **147** | 0.477 | 1,095 |
| **148** | 0.469 | 1,072 |
| **149** | 0.461 | 1,050 |
| **150** | 0.453 | 1,029 |
| **151** | 0.445 | 1,007 |
| **152** | 0.438 | 986 |
| **153** | 0.430 | 965 |
| **154** | 0.423 | 945 |
| **155** | 0.416 | 925 |
| **156** | 0.408 | 906 |
| **157** | 0.402 | 887 |
| **158** | 0.395 | 868 |
| **159** | 0.388 | 850 |
| **160** | 0.381 | 832 |
| **161** | 0.375 | 815 |
| **162** | 0.369 | 798 |
| **163** | 0.362 | 782 |
| **164** | 0.356 | 765 |
| **165** | 0.350 | 750 |
| **166** | 0.344 | 734 |
| **167** | 0.339 | 719 |
| **168** | 0.333 | 705 |
| **169** | 0.327 | 690 |
| **170** | 0.322 | 677 |
| **171** | 0.317 | 663 |
| **172** | 0.311 | 650 |
| **173** | 0.306 | 638 |
| **174** | 0.301 | 626 |
| **175** | 0.296 | 614 |
| **176** | 0.291 | 602 |
| **177** | 0.286 | 591 |
| **178** | 0.282 | 581 |
| **179** | 0.277 | 570 |
| **180** | 0.272 | 561 |
| **181** | 0.268 | 551 |
| **182** | 0.264 | 542 |
| **183** | 0.259 | 533 |
| **184** | 0.255 | 524 |
| **185** | 0.251 | 516 |
| **186** | 0.247 | 508 |
| **187** | 0.243 | 501 |
| **188** | 0.239 | 494 |
| **189** | 0.235 | 487 |
| **190** | 0.231 | 480 |
| **191** | 0.228 | 473 |
| **192** | 0.224 | 467 |
| **193** | 0.220 | 461 |
| **194** | 0.217 | 456 |
| **195** | 0.213 | 450 |
| **196** | 0.210 | 445 |
| **197** | 0.206 | 439 |
| **198** | 0.203 | 434 |
| **199** | 0.200 | 429 |
| **200** | 0.197 | 424 |
| **201** | 0.194 | 419 |
| **202** | 0.191 | 415 |
| **203** | 0.188 | 410 |
| **204** | 0.185 | 405 |
| **205** | 0.182 | 401 |
| **206** | 0.179 | 396 |
| **207** | 0.176 | 391 |
| **208** | 0.173 | 386 |
| **209** | 0.171 | 382 |
| **210** | 0.168 | 377 |
| **211** | 0.165 | 372 |
| **212** | 0.163 | 367 |
| **213** | 0.160 | 361 |
| **214** | 0.158 | 356 |
| **215** | 0.155 | 350 |
| **216** | 0.153 | 344 |
| **217** | 0.151 | 338 |
| **218** | 0.148 | 332 |
| **219** | 0.146 | 325 |
| **220** | 0.144 | 318 |
| **221** | 0.142 | 311 |
| **222** | 0.140 | 304 |
| **223** | 0.138 | 297 |
| **224** | 0.135 | 289 |
| **225** | 0.133 | 282 |

## Table 26 — 5K Thermistor Temperatures (°C) vs. Resistance/Voltage Drop (Voltage Drop for EWT, LWT, RGT, CNDE, CNDL, Dual Chiller, and OAT)

| TEMP (C) | VOLTAGE DROP (V) | RESISTANCE (Ohms) |
|---|---|---|
| **–32** | 3.705 | 100,260 |
| **–31** | 3.687 | 94,165 |
| **–30** | 3.668 | 88,480 |
| **–29** | 3.649 | 83,170 |
| **–28** | 3.629 | 78,125 |
| **–27** | 3.608 | 73,580 |
| **–26** | 3.586 | 69,250 |
| **–25** | 3.563 | 65,205 |
| **–24** | 3.539 | 61,420 |
| **–23** | 3.514 | 57,875 |
| **–22** | 3.489 | 54,555 |
| **–21** | 3.462 | 51,450 |
| **–20** | 3.434 | 48,536 |
| **–19** | 3.406 | 45,807 |
| **–18** | 3.376 | 43,247 |
| **–17** | 3.345 | 40,845 |
| **–16** | 3.313 | 38,592 |
| **–15** | 3.281 | 38,476 |
| **–14** | 3.247 | 34,489 |
| **–13** | 3.212 | 32,621 |
| **–12** | 3.177 | 30,866 |
| **–11** | 3.140 | 29,216 |
| **–10** | 3.103 | 27,633 |
| **–9** | 3.065 | 26,202 |
| **–8** | 3.025 | 24,827 |
| **–7** | 2.985 | 23,532 |
| **–6** | 2.945 | 22,313 |
| **–5** | 2.903 | 21,163 |
| **–4** | 2.860 | 20,079 |
| **–3** | 2.817 | 19,058 |
| **–2** | 2.774 | 18,094 |
| **–1** | 2.730 | 17,184 |
| **0** | 2.685 | 16,325 |
| **1** | 2.639 | 15,515 |
| **2** | 2.593 | 14,749 |
| **3** | 2.547 | 14,026 |
| **4** | 2.500 | 13,342 |
| **5** | 2.454 | 12,696 |
| **6** | 2.407 | 12,085 |
| **7** | 2.360 | 11,506 |
| **8** | 2.312 | 10,959 |
| **9** | 2.265 | 10,441 |
| **10** | 2.217 | 9,949 |
| **11** | 2.170 | 9,485 |
| **12** | 2.123 | 9,044 |
| **13** | 2.076 | 8,627 |
| **14** | 2.029 | 8,231 |
| **15** | 1.982 | 7,855 |
| **16** | 1.935 | 7,499 |
| **17** | 1.889 | 7,161 |
| **18** | 1.844 | 6,840 |
| **19** | 1.799 | 6,536 |
| **20** | 1.754 | 6,246 |
| **21** | 1.710 | 5,971 |
| **22** | 1.666 | 5,710 |
| **23** | 1.623 | 5,461 |
| **24** | 1.580 | 5,225 |
| **25** | 1.538 | 5,000 |
| **26** | 1.497 | 4,786 |
| **27** | 1.457 | 4,583 |
| **28** | 1.417 | 4,389 |
| **29** | 1.378 | 4,204 |
| **30** | 1.340 | 4,028 |
| **31** | 1.302 | 3,861 |
| **32** | 1.265 | 3,701 |
| **33** | 1.229 | 3,549 |
| **34** | 1.194 | 3,404 |
| **35** | 1.160 | 3,266 |
| **36** | 1.126 | 3,134 |
| **37** | 1.093 | 3,008 |
| **38** | 1.061 | 2,888 |
| **39** | 1.030 | 2,773 |
| **40** | 0.999 | 2,663 |
| **41** | 0.969 | 2,559 |
| **42** | 0.940 | 2,459 |
| **43** | 0.912 | 2,363 |
| **44** | 0.885 | 2,272 |
| **45** | 0.858 | 2,184 |
| **46** | 0.832 | 2,101 |
| **47** | 0.807 | 2,021 |
| **48** | 0.782 | 1,944 |
| **49** | 0.758 | 1,871 |
| **50** | 0.735 | 1,801 |
| **51** | 0.713 | 1,734 |
| **52** | 0.691 | 1,670 |
| **53** | 0.669 | 1,609 |
| **54** | 0.649 | 1,550 |
| **55** | 0.629 | 1,493 |
| **56** | 0.610 | 1,439 |
| **57** | 0.591 | 1,387 |
| **58** | 0.573 | 1,337 |
| **59** | 0.555 | 1,290 |
| **60** | 0.538 | 1,244 |
| **61** | 0.522 | 1,200 |
| **62** | 0.506 | 1,158 |
| **63** | 0.490 | 1,118 |
| **64** | 0.475 | 1,079 |
| **65** | 0.461 | 1,041 |
| **66** | 0.447 | 1,006 |
| **67** | 0.433 | 971 |
| **68** | 0.420 | 938 |
| **69** | 0.407 | 906 |
| **70** | 0.395 | 876 |
| **71** | 0.383 | 836 |
| **72** | 0.371 | 805 |
| **73** | 0.360 | 775 |
| **74** | 0.349 | 747 |
| **75** | 0.339 | 719 |
| **76** | 0.329 | 693 |
| **77** | 0.319 | 669 |
| **78** | 0.309 | 645 |
| **79** | 0.300 | 623 |
| **80** | 0.291 | 602 |
| **81** | 0.283 | 583 |
| **82** | 0.274 | 564 |
| **83** | 0.266 | 547 |
| **84** | 0.258 | 531 |
| **85** | 0.251 | 516 |
| **86** | 0.244 | 502 |
| **87** | 0.237 | 489 |
| **88** | 0.230 | 477 |
| **89** | 0.223 | 466 |
| **90** | 0.217 | 456 |
| **91** | 0.211 | 446 |
| **92** | 0.204 | 436 |
| **93** | 0.199 | 427 |
| **94** | 0.193 | 419 |
| **95** | 0.188 | 410 |
| **96** | 0.182 | 402 |
| **97** | 0.177 | 393 |
| **98** | 0.172 | 385 |
| **99** | 0.168 | 376 |
| **100** | 0.163 | 367 |
| **101** | 0.158 | 357 |
| **102** | 0.154 | 346 |
| **103** | 0.150 | 335 |
| **104** | 0.146 | 324 |
| **105** | 0.142 | 312 |
| **106** | 0.138 | 299 |
| **107** | 0.134 | 285 |

## Table 27 — 10K Thermistor Temperature (°F) vs. Resistance/Voltage Drop (For SPT)

| TEMP (F) | VOLTAGE DROP (V) | RESISTANCE (Ohms) |
|---|---|---|
| **–25** | 4.758 | 196,453 |
| **–24** | 4.750 | 189,692 |
| **–23** | 4.741 | 183,300 |
| **–22** | 4.733 | 177,000 |
| **–21** | 4.724 | 171,079 |
| **–20** | 4.715 | 165,238 |
| **–19** | 4.705 | 159,717 |
| **–18** | 4.696 | 154,344 |
| **–17** | 4.686 | 149,194 |
| **–16** | 4.676 | 144,250 |
| **–15** | 4.665 | 139,443 |
| **–14** | 4.655 | 134,891 |
| **–13** | 4.644 | 130,402 |
| **–12** | 4.633 | 126,183 |
| **–11** | 4.621 | 122,018 |
| **–10** | 4.609 | 118,076 |
| **–9** | 4.597 | 114,236 |
| **–8** | 4.585 | 110,549 |
| **–7** | 4.572 | 107,006 |
| **–6** | 4.560 | 103,558 |
| **–5** | 4.546 | 100,287 |
| **–4** | 4.533 | 97,060 |
| **–3** | 4.519 | 94,020 |
| **–2** | 4.505 | 91,019 |
| **–1** | 4.490 | 88,171 |
| **0** | 4.476 | 85,396 |
| **1** | 4.461 | 82,729 |
| **2** | 4.445 | 80,162 |
| **3** | 4.429 | 77,662 |
| **4** | 4.413 | 75,286 |
| **5** | 4.397 | 72,940 |
| **6** | 4.380 | 70,727 |
| **7** | 4.363 | 68,542 |
| **8** | 4.346 | 66,465 |
| **9** | 4.328 | 64,439 |
| **10** | 4.310 | 62,491 |
| **11** | 4.292 | 60,612 |
| **12** | 4.273 | 58,781 |
| **13** | 4.254 | 57,039 |
| **14** | 4.235 | 55,319 |
| **15** | 4.215 | 53,693 |
| **16** | 4.195 | 52,086 |
| **17** | 4.174 | 50,557 |
| **18** | 4.153 | 49,065 |
| **19** | 4.132 | 47,627 |
| **20** | 4.111 | 46,240 |
| **21** | 4.089 | 44,888 |
| **22** | 4.067 | 43,598 |
| **23** | 4.044 | 42,324 |
| **24** | 4.021 | 41,118 |
| **25** | 3.998 | 39,926 |
| **26** | 3.975 | 38,790 |
| **27** | 3.951 | 37,681 |
| **28** | 3.927 | 36,610 |
| **29** | 3.903 | 35,577 |
| **30** | 3.878 | 34,569 |
| **31** | 3.853 | 33,606 |
| **32** | 3.828 | 32,654 |
| **33** | 3.802 | 31,752 |
| **34** | 3.776 | 30,860 |
| **35** | 3.750 | 30,009 |
| **36** | 3.723 | 29,177 |
| **37** | 3.697 | 28,373 |
| **38** | 3.670 | 27,597 |
| **39** | 3.654 | 26,838 |
| **40** | 3.615 | 26,113 |
| **41** | 3.587 | 25,396 |
| **42** | 3.559 | 24,715 |
| **43** | 3.531 | 24,042 |
| **44** | 3.503 | 23,399 |
| **45** | 3.474 | 22,770 |
| **46** | 3.445 | 22,161 |
| **47** | 3.416 | 21,573 |
| **48** | 3.387 | 20,998 |
| **49** | 3.357 | 20,447 |
| **50** | 3.328 | 19,903 |
| **51** | 3.298 | 19,386 |
| **52** | 3.268 | 18,874 |
| **53** | 3.238 | 18,384 |
| **54** | 3.208 | 17,904 |
| **55** | 3.178 | 17,441 |
| **56** | 3.147 | 16,991 |
| **57** | 3.117 | 16,552 |
| **58** | 3.086 | 16,131 |
| **59** | 3.056 | 15,714 |
| **60** | 3.025 | 15,317 |
| **61** | 2.994 | 14,925 |
| **62** | 2.963 | 14,549 |
| **63** | 2.932 | 14,180 |
| **64** | 2.901 | 13,824 |
| **65** | 2.870 | 13,478 |
| **66** | 2.839 | 13,139 |
| **67** | 2.808 | 12,814 |
| **68** | 2.777 | 12,493 |
| **69** | 2.746 | 12,187 |
| **70** | 2.715 | 11,884 |
| **71** | 2.684 | 11,593 |
| **72** | 2.653 | 11,308 |
| **73** | 2.622 | 11,031 |
| **74** | 2.592 | 10,764 |
| **75** | 2.561 | 10,501 |
| **76** | 2.530 | 10,249 |
| **77** | 2.500 | 10,000 |
| **78** | 2.470 | 9,762 |
| **79** | 2.439 | 9,526 |
| **80** | 2.409 | 9,300 |
| **81** | 2.379 | 9,078 |
| **82** | 2.349 | 8,862 |
| **83** | 2.319 | 8,653 |
| **84** | 2.290 | 8,448 |
| **85** | 2.260 | 8,251 |
| **86** | 2.231 | 8,056 |
| **87** | 2.202 | 7,869 |
| **88** | 2.173 | 7,685 |
| **89** | 2.144 | 7,507 |
| **90** | 2.115 | 7,333 |
| **91** | 2.087 | 7,165 |
| **92** | 2.059 | 6,999 |
| **93** | 2.030 | 6,838 |
| **94** | 2.003 | 6,683 |
| **95** | 1.975 | 6,530 |
| **96** | 1.948 | 6,383 |
| **97** | 1.921 | 6,238 |
| **98** | 1.894 | 6,098 |
| **99** | 1.867 | 5,961 |
| **100** | 1.841 | 5,827 |
| **101** | 1.815 | 5,698 |
| **102** | 1.789 | 5,571 |
| **103** | 1.763 | 5,449 |
| **104** | 1.738 | 5,327 |
| **105** | 1.713 | 5,210 |
| **106** | 1.688 | 5,095 |
| **107** | 1.663 | 4,984 |
| **108** | 1.639 | 4,876 |
| **109** | 1.615 | 4,769 |
| **110** | 1.591 | 4,666 |
| **111** | 1.567 | 4,564 |
| **112** | 1.544 | 4,467 |
| **113** | 1.521 | 4,370 |
| **114** | 1.498 | 4,277 |
| **115** | 1.475 | 4,185 |
| **116** | 1.453 | 4,096 |
| **117** | 1.431 | 4,008 |
| **118** | 1.409 | 3,923 |
| **119** | 1.387 | 3,840 |
| **120** | 1.366 | 3,759 |
| **121** | 1.345 | 3,681 |
| **122** | 1.324 | 3,603 |
| **123** | 1.304 | 3,529 |
| **124** | 1.284 | 3,455 |
| **125** | 1.264 | 3,383 |
| **126** | 1.244 | 3,313 |
| **127** | 1.225 | 3,244 |
| **128** | 1.206 | 3,178 |
| **129** | 1.187 | 3,112 |
| **130** | 1.168 | 3,049 |
| **131** | 1.150 | 2,986 |
| **132** | 1.132 | 2,926 |
| **133** | 1.114 | 2,866 |
| **134** | 1.096 | 2,809 |
| **135** | 1.079 | 2,752 |
| **136** | 1.062 | 2,697 |
| **137** | 1.045 | 2,643 |
| **138** | 1.028 | 2,590 |
| **139** | 1.012 | 2,539 |
| **140** | 0.996 | 2,488 |
| **141** | 0.980 | 2,439 |
| **142** | 0.965 | 2,391 |
| **143** | 0.949 | 2,343 |
| **144** | 0.934 | 2,297 |
| **145** | 0.919 | 2,253 |
| **146** | 0.905 | 2,209 |
| **147** | 0.890 | 2,166 |
| **148** | 0.876 | 2,124 |
| **149** | 0.862 | 2,083 |
| **150** | 0.848 | 2,043 |
| **151** | 0.835 | 2,003 |
| **152** | 0.821 | 1,966 |
| **153** | 0.808 | 1,928 |
| **154** | 0.795 | 1,891 |
| **155** | 0.782 | 1,855 |
| **156** | 0.770 | 1,820 |
| **157** | 0.758 | 1,786 |
| **158** | 0.745 | 1,752 |
| **159** | 0.733 | 1,719 |
| **160** | 0.722 | 1,687 |
| **161** | 0.710 | 1,656 |
| **162** | 0.699 | 1,625 |
| **163** | 0.687 | 1,594 |
| **164** | 0.676 | 1,565 |
| **165** | 0.666 | 1,536 |
| **166** | 0.655 | 1,508 |
| **167** | 0.645 | 1,480 |
| **168** | 0.634 | 1,453 |
| **169** | 0.624 | 1,426 |
| **170** | 0.614 | 1,400 |
| **171** | 0.604 | 1,375 |
| **172** | 0.595 | 1,350 |
| **173** | 0.585 | 1,326 |
| **174** | 0.576 | 1,302 |
| **175** | 0.567 | 1,278 |
| **176** | 0.558 | 1,255 |
| **177** | 0.549 | 1,233 |
| **178** | 0.540 | 1,211 |
| **179** | 0.532 | 1,190 |
| **180** | 0.523 | 1,169 |
| **181** | 0.515 | 1,148 |
| **182** | 0.507 | 1,128 |
| **183** | 0.499 | 1,108 |
| **184** | 0.491 | 1,089 |
| **185** | 0.483 | 1,070 |
| **186** | 0.476 | 1,052 |
| **187** | 0.468 | 1,033 |
| **188** | 0.461 | 1,016 |
| **189** | 0.454 | 998 |
| **190** | 0.447 | 981 |
| **191** | 0.440 | 964 |
| **192** | 0.433 | 947 |
| **193** | 0.426 | 931 |
| **194** | 0.419 | 915 |
| **195** | 0.413 | 900 |
| **196** | 0.407 | 885 |
| **197** | 0.400 | 870 |
| **198** | 0.394 | 855 |
| **199** | 0.388 | 841 |
| **200** | 0.382 | 827 |
| **201** | 0.376 | 814 |
| **202** | 0.370 | 800 |
| **203** | 0.365 | 787 |
| **204** | 0.359 | 774 |
| **205** | 0.354 | 762 |
| **206** | 0.349 | 749 |
| **207** | 0.343 | 737 |
| **208** | 0.338 | 725 |
| **209** | 0.333 | 714 |
| **210** | 0.328 | 702 |
| **211** | 0.323 | 691 |
| **212** | 0.318 | 680 |
| **213** | 0.314 | 670 |
| **214** | 0.309 | 659 |
| **215** | 0.305 | 649 |
| **216** | 0.300 | 639 |
| **217** | 0.296 | 629 |
| **218** | 0.292 | 620 |
| **219** | 0.288 | 610 |
| **220** | 0.284 | 601 |
| **221** | 0.279 | 592 |
| **222** | 0.275 | 583 |
| **223** | 0.272 | 574 |
| **224** | 0.268 | 566 |
| **225** | 0.264 | 557 |

## Table 28 — 10K Thermistor Temperature (°C) vs. Resistance/Voltage Drop (For SPT)

| TEMP (C) | VOLTAGE DROP (V) | RESISTANCE (Ohms) | TEMP (C) | VOLTAGE DROP (V) | RESISTANCE (Ohms) | TEMP (C) | VOLTAGE DROP (V) | RESISTANCE (Ohms) |
|---|---|---|---|---|---|---|---|---|
| **–32** | 4.762 | 200,510 | **15** | 3.056 | 15,714 | **62** | 0.940 | 2,315 |
| **–31** | 4.748 | 188,340 | **16** | 3.000 | 15,000 | **63** | 0.913 | 2,235 |
| **–30** | 4.733 | 177,000 | **17** | 2.944 | 14,323 | **64** | 0.887 | 2,157 |
| **–29** | 4.716 | 166,342 | **18** | 2.889 | 13,681 | **65** | 0.862 | 2,083 |
| **–28** | 4.700 | 156,404 | **19** | 2.833 | 13,071 | **66** | 0.837 | 2,011 |
| **–27** | 4.682 | 147,134 | **20** | 2.777 | 12,493 | **67** | 0.813 | 1,943 |
| **–26** | 4.663 | 138,482 | **21** | 2.721 | 11,942 | **68** | 0.790 | 1,876 |
| **–25** | 4.644 | 130,402 | **22** | 2.666 | 11,418 | **69** | 0.767 | 1,813 |
| **–24** | 4.624 | 122,807 | **23** | 2.610 | 10,921 | **70** | 0.745 | 1,752 |
| **–23** | 4.602 | 115,710 | **24** | 2.555 | 10,449 | **71** | 0.724 | 1,693 |
| **–22** | 4.580 | 109,075 | **25** | 2.500 | 10,000 | **72** | 0.703 | 1,637 |
| **–21** | 4.557 | 102,868 | **26** | 2.445 | 9,571 | **73** | 0.683 | 1,582 |
| **–20** | 4.533 | 97,060 | **27** | 2.391 | 9,164 | **74** | 0.663 | 1,530 |
| **–19** | 4.508 | 91,588 | **28** | 2.337 | 8,776 | **75** | 0.645 | 1,480 |
| **–18** | 4.482 | 86,463 | **29** | 2.284 | 8,407 | **76** | 0.626 | 1,431 |
| **–17** | 4.455 | 81,662 | **30** | 2.231 | 8,056 | **77** | 0.608 | 1,385 |
| **–16** | 4.426 | 77,162 | **31** | 2.178 | 7,720 | **78** | 0.591 | 1,340 |
| **–15** | 4.397 | 72,940 | **32** | 2.127 | 7,401 | **79** | 0.574 | 1,297 |
| **–14** | 4.367 | 68,957 | **33** | 2.075 | 7,096 | **80** | 0.558 | 1,255 |
| **–13** | 4.335 | 65,219 | **34** | 2.025 | 6,806 | **81** | 0.542 | 1,215 |
| **–12** | 4.303 | 61,711 | **35** | 1.975 | 6,530 | **82** | 0.527 | 1,177 |
| **–11** | 4.269 | 58,415 | **36** | 1.926 | 6,266 | **83** | 0.512 | 1,140 |
| **–10** | 4.235 | 55,319 | **37** | 1.878 | 6,014 | **84** | 0.497 | 1,104 |
| **–9** | 4.199 | 52,392 | **38** | 1.830 | 5,774 | **85** | 0.483 | 1,070 |
| **–8** | 4.162 | 49,640 | **39** | 1.784 | 5,546 | **86** | 0.470 | 1,037 |
| **–7** | 4.124 | 47,052 | **40** | 1.738 | 5,327 | **87** | 0.457 | 1,005 |
| **–6** | 4.085 | 44,617 | **41** | 1.692 | 5,117 | **88** | 0.444 | 974 |
| **–5** | 4.044 | 42,324 | **42** | 1.648 | 4,918 | **89** | 0.431 | 944 |
| **–4** | 4.003 | 40,153 | **43** | 1.605 | 4,727 | **90** | 0.419 | 915 |
| **–3** | 3.961 | 38,109 | **44** | 1.562 | 4,544 | **91** | 0.408 | 889 |
| **–2** | 3.917 | 36,182 | **45** | 1.521 | 4,370 | **92** | 0.396 | 861 |
| **–1** | 3.873 | 34,367 | **46** | 1.480 | 4,203 | **93** | 0.386 | 836 |
| **0** | 3.828 | 32,654 | **47** | 1.439 | 4,042 | **94** | 0.375 | 811 |
| **1** | 3.781 | 31,030 | **48** | 1.400 | 3,889 | **95** | 0.365 | 787 |
| **2** | 3.734 | 29,498 | **49** | 1.362 | 3,743 | **96** | 0.355 | 764 |
| **3** | 3.686 | 28,052 | **50** | 1.324 | 3,603 | **97** | 0.345 | 742 |
| **4** | 3.637 | 26,686 | **51** | 1.288 | 3,469 | **98** | 0.336 | 721 |
| **5** | 3.587 | 25,396 | **52** | 1.252 | 3,340 | **99** | 0.327 | 700 |
| **6** | 3.537 | 24,171 | **53** | 1.217 | 3,217 | **100** | 0.318 | 680 |
| **7** | 3.485 | 23,013 | **54** | 1.183 | 3,099 | **101** | 0.310 | 661 |
| **8** | 3.433 | 21,918 | **55** | 1.150 | 2,986 | **102** | 0.302 | 643 |
| **9** | 3.381 | 20,883 | **56** | 1.117 | 2,878 | **103** | 0.294 | 626 |
| **10** | 3.328 | 19,903 | **57** | 1.086 | 2,774 | **104** | 0.287 | 609 |
| **11** | 3.274 | 18,972 | **58** | 1.055 | 2,675 | **105** | 0.279 | 592 |
| **12** | 3.220 | 18,090 | **59** | 1.025 | 2,579 | **106** | 0.272 | 576 |
| **13** | 3.165 | 17,255 | **60** | 0.996 | 2,488 | **107** | 0.265 | 561 |
| **14** | 3.111 | 16,464 | **61** | 0.968 | 2,400 | | | |

## Table 29 — 86K Thermistor vs Resistance (DTT)

| TEMP (C) | TEMP (F) | RESISTANCE (Ohms) | TEMP (C) | TEMP (F) | RESISTANCE (Ohms) |
|---|---|---|---|---|---|
| **-40** | **-40** | 2,889,600 | **75** | **167** | 12,730 |
| **-35** | **-31** | 2,087,220 | **80** | **176** | 10,790 |
| **-30** | **-22** | 1,522,200 | **85** | **185** | 9,200 |
| **-25** | **-13** | 1,121,440 | **90** | **194** | 7,870 |
| **-20** | **-4** | 834,720 | **95** | **203** | 6,770 |
| **-15** | **5** | 627,280 | **100** | **212** | 5,850 |
| **-10** | **14** | 475,740 | **105** | **221** | 5,090 |
| **-5** | **23** | 363,990 | **110** | **230** | 4,450 |
| **0** | **32** | 280,820 | **115** | **239** | 3,870 |
| **5** | **41** | 218,410 | **120** | **248** | 3,350 |
| **10** | **50** | 171,170 | **125** | **257** | 2,920 |
| **15** | **59** | 135,140 | **130** | **266** | 2,580 |
| **20** | **68** | 107,440 | **135** | **275** | 2,280 |
| **25** | **77** | 86,000 | **140** | **284** | 2,020 |
| **30** | **86** | 69,280 | **145** | **293** | 1,800 |
| **35** | **95** | 56,160 | **150** | **302** | 1,590 |
| **40** | **104** | 45,810 | **155** | **311** | 1,390 |
| **45** | **113** | 37,580 | **160** | **320** | 1,250 |
| **50** | **122** | 30,990 | **165** | **329** | 1,120 |
| **55** | **131** | 25,680 | **170** | **338** | 1,010 |
| **60** | **140** | 21,400 | **175** | **347** | 920 |
| **70** | **158** | 15,070 | **180** | **356** | 830 |

**Strainer —** Periodic cleaning of the required field-installed strainer is required. Pressure drop across strainer in excess of 3 psi (21 kPa) indicates the need for cleaning. Normal (clean) pressure drop is approximately 1 psi (6.9 kPa). Open the blowdown valve to clean the strainer. If required, shut the chiller down and remove the strainer screen to clean. When strainer has been cleaned, enter 'YES' for Strainer Maintenance Done (***Run Status→PM→S.T.MN***).

**Replacing Defective Modules —** The *Comfort*-Link replacement modules are shown in Table 30. If the main base board (MBB) has been replaced, verify that all configuration data is correct. Follow the ***Configuration*** mode table and verify that all items under sub-modes ***UNIT***, ***OPT1*** and ***OPT2*** are correct. Any additional field-installed accessories or options (***RSET***, ***SLCT*** sub-modes) should also be verified as well as any specific time and maintenance schedules.

Refer to the Start-Up Checklist for 30MP Liquid Chillers (completed at time of original start-up) found in the job folder. This information is needed later in this procedure. If the checklist does not exist, fill out the current information in the Configuration mode on a new checklist. Tailor the various options and configurations as needed for this particular installation.

**⚠ WARNING**

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

1. Check that all power to unit is off. Carefully disconnect all wires from the defective module by unplugging its connectors.
2. Remove the defective module by removing its mounting screws with a Phillips screwdriver, and removing the module from the control box. Save the screws later use.
3. Verify that the instance jumper (MBB) or address switches (all other modules) exactly match the settings of the defective module.

   NOTE: Handle boards by mounting standoffs only to avoid electrostatic discharge.
4. Package the defective module in the carton of the new module for return to Carrier.
5. Mount the new module in the unit's control box using a Phillips screwdriver and the screws saved in Step 2.
6. Reinstall all module connectors. For accessory Navigator™ device replacement, make sure the plug is installed at TB3 in the LEN connector.
7. Carefully check all wiring connections before restoring power.
8. Verify the ENABLE/OFF/REMOTE CONTACT switch is in the OFF position.
9. Restore control power. Verify that all module red LEDs blink in unison. Verify that all green LEDs are blinking and that the scrolling marquee or Navigator™ display is communicating correctly.
10. Verify all configuration information, settings, set points and schedules. Return the ENABLE/OFF/REMOTE CONTACT switch to its previous position.

**Table 30 — Replacement Modules**

| MODULE | REPLACEMENT PART NO. (with Software) |
|---|---|
| **Main Base Board (MBB)** | 30MP500346 |
| **Scrolling Marquee Display** | HK50AA031 |
| **Energy Management Module (EMM)** | 30GT515218 |
| **Navigator Display** | HK50AA033 |

## MAINTENANCE

**Recommended Maintenance Schedule —** The following are only recommended guidelines. Jobsite conditions may dictate that maintenance schedule is performed more often than recommended.

Routine:

Every month:
- Check moisture indicating sight glass for possible refrigerant loss and presence of moisture.

Every 3 months (for all machines):
- Check refrigerant charge.
- Check all refrigerant joints and valves for refrigerant leaks, repair as necessary.
- Check chilled water flow switch operation.
- Check compressor oil level.

Every 12 months (for all machines):
- Check all electrical connections, tighten as necessary.
- Inspect all contactors and relays, replace as necessary.
- Check accuracy of thermistors, replace if greater than ± 2° F (1.2° C) variance from calibrated thermometer.
- Check to be sure that the proper concentration of antifreeze is present in the chilled water loop, if applicable.
- Verify that the chilled water loop is properly treated.
- Check refrigerant filter driers for excessive pressure drop, replace as necessary.
- Check chilled water and condenser strainers, clean as necessary.
- Perform Service Test to confirm operation of all components.
- Check for excessive cooler approach (Leaving Chilled Water Temperature — Saturated Suction Temperature) which may indicate fouling. Clean evaporator if necessary.

## TROUBLESHOOTING

**Complete Unit Stoppage and Restart —** Possible causes for unit stoppage and reset methods are shown below and in Table 31. Refer to Fig. 3-7 for component arrangement and control wiring diagrams.

GENERAL POWER FAILURE — After power is restored, restart is automatic through normal MBB start-up.

UNIT ENABLE-OFF-REMOTE CONTACT SWITCH IS OFF — When the switch is OFF, the unit will stop immediately. Place the switch in the ENABLE position for local switch control or in the REMOTE CONTACT position for control through remote contact closure.

CHILLED FLUID PROOF-OF-FLOW SWITCH OPEN — After the problem causing the loss of flow has been corrected, reset is manual by resetting the alarm with the scrolling marquee.

OPEN 24-V CONTROL CIRCUIT BREAKER(S) — Determine the cause of the failure and correct. Reset circuit breaker(s). Restart is automatic after MBB start-up cycle is complete.

COOLING LOAD SATISFIED — Unit shuts down when cooling load has been satisfied. Unit restarts when required to satisfy leaving fluid temperature set point.

THERMISTOR FAILURE — If a thermistor fails in either an open or shorted condition, the unit will be shut down. Replace EWT, or LWT as required. Unit restarts automatically, but must be reset manually by resetting the alarm with the scrolling marquee.

**⚠ CAUTION**

If unit stoppage occurs more than once as a result of any of the safety devices listed, determine and correct cause before attempting another restart.

LOW SATURATED SUCTION — Several conditions can lead to low saturated suction alarms and the chiller controls have several override modes built in which will attempt to keep the chiller from shutting down. Low fluid flow, low refrigerant charge and plugged filter driers are the main causes for this condition. To avoid permanent damage and potential freezing of the system, do NOT repeatedly reset these alert and/or alarm conditions without identifying and correcting the cause(s).

COMPRESSOR SAFETIES — The 30MP units with *Comfort*Link controls include a compressor protection board that protects the operation of each of the compressors. Each board senses the presence or absence of current to each compressor.

If there is a command for a compressor to run and there is no current, then one of the following safeties or conditions have turned the compressor off:

Compressor Overcurrent — All compressors have internal line breaks or a motor protection device located in the compressor electrical box.

Compressor Short Circuit — There will not be current if the compressor circuit breaker that provides short circuit protection has tripped.

Compressor Motor Over Temperature — The internal linebreak or over temperature switch has opened.

High-Pressure Switch Trip — The high-pressure switch has opened. See Table 24 for the factory settings for the fixed high-pressure switch.

ASTP Protection Trip — All non-digital Copeland compressors are equipped with an advanced scroll temperature protection (ASTP). A label located above the terminal box identifies models that contain this technology. See Fig. 25.

Advanced scroll temperature protection is a form of internal discharge temperature protection that unloads the scroll compressor when the internal temperature reaches approximately 300 F (149 C). At this temperature, an internal bi-metal disk valve opens and causes the scroll elements to separate, which stops compression. Suction and discharge pressures balance while the motor continues to run. The longer the compressor runs unloaded, the longer it must cool before the bi-metal disk resets. See Fig. 26 for approximate reset times.

Copeland Scroll
Advanced Scroll Temperature Protection
Compressor May Stop Pumping With Motor Running.
Turn Off And Wait Until Cool.
May Need More Than 1 Hour To Reset.
052-1272-00
www.EmersonClimateContractor.com/ASTP

**Fig. 25 — Advanced Scroll Temperature Protection Label**

To manually reset ASTP, the compressor should be stopped and allowed to cool. If the compressor is not stopped, the motor will run until the motor protector trips, which occurs up to 90 minutes later. Advanced scroll temperature protection will reset automatically before the motor protector resets, which may take up to 2 hours.

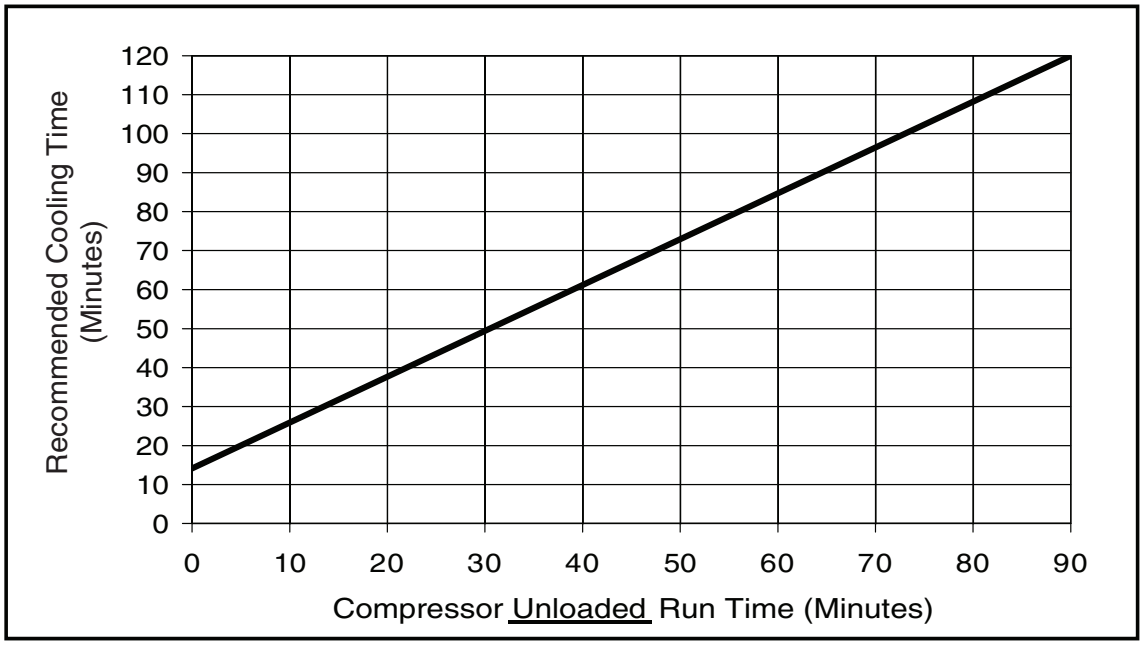
High Discharge Gas Temperature Protection — Units equipped with optional digital compressors have an additional thermistor located on the discharge line, If discharge temperature exceeds 265 F (129.4 C), the digital compressor will be shut off.

Alarms will also occur if the current sensor board malfunctions or is not properly connected to its assigned digital input. If the compressor is commanded OFF and the current sensor reads ON, an alert is generated. This will indicate that a compressor contactor has failed closed. In this case, a special mode, Compressor Stuck on Control, will be enabled and all other compressors will be turned off. An alarm will then be enabled to indicate that service is required. Outdoor fans will continue to operate. The condenser output is turned on immediately.

**Alarms and Alerts —** These are warnings of abnormal or fault conditions, and may cause either one circuit or the whole unit to shut down. They are assigned code numbers as described in Table 32.

Automatic alarms will reset without operator intervention if the condition corrects itself. The following method must be used to reset manual alarms:

Before resetting any alarm, first determine the cause of the alarm and correct it. Enter the Alarms mode indicated by the LED on the side of the scrolling marquee display. Press ENTER and ▼ until the sub-menu item RCRN "RESET ALL CURRENT ALARMS" is displayed. Press ENTER. The control will prompt the user for a password, by displaying PASS and WORD. Press ENTER to display the default password, 1111. Press ENTER for each character. If the password has been changed, use the arrow keys to change each individual character. Toggle the display to "YES" and press ENTER. The alarms will be reset.




*Times are approximate.
NOTE: Various factors, including high humidity, high ambient temperature, and the presence of a sound blanket will increase cool-down times.

**Fig. 26 — Recommended Minimum Cool Down Time After Compressor is Stopped***

## Table 31 — Troubleshooting

| SYMPTOMS | CAUSE | REMEDY |
|---|---|---|
| **Compressor Cycles Off on Loss of Charge** | Loss of charge control. Acting erratically. | Repair leak and recharge. |
| | | Replace control. |
| | Low refrigerant charge | Add refrigerant. |
| | Low suction temperature | Raise cooler leaving fluid temperature set point. |
| **Compressor Cycles Off on Out of Range Condition** | Thermistor failure | Replace thermistor. |
| | System load was reduced faster than controller could remove stages | Unit will restart after fluid temperature rises back into the control band. Avoid rapidly removing system load or increase loop volume. |
| | Temperature controller deadband setting is too low | Raise deadband setting. |
| **Compressor Shuts Down on High-Pressure Control** | High-pressure control acting erratically | Replace control. |
| | Noncondensables in system | Purge system. |
| | Condenser scaled/dirty | Clean condenser. |
| | Fans in remote condensing unit (30MPA only) not operating | Repair or replace if defective. |
| | System overcharged with refrigerant | Reduce charge. |
| **Unit Operates Too Long or Continuously** | Low refrigerant charge | Add refrigerant. |
| | Control contacts fused | Replace control. |
| | Air in system | Purge system. |
| | Partially plugged or plugged expansion valve or filter drier | Clean or replace as needed. |
| | Defective insulation | Replace or repair as needed. |
| | Service load | Keep doors and windows closed. |
| | Damaged compressor | Check compressor and replace if necessary. |
| **Unusual or Loud System Noises** | Piping vibration | Support piping as required. |
| | | Check for loose pipe connections or damaged compressor |
| | Expansion valve hissing | Add refrigerant. |
| | | Check for plugged liquid line filter drier. |
| | Compressor noisy | Replace compressor (worn bearings). |
| | | Check for loose compressor holddown bolts. |
| **Compressor Loses Oil** | Leak in system | Repair leak. |
| | Mechanical damage (Failed seals or broken scrolls) | Replace compressor. |
| | Oil trapped in line | Check piping for oil traps. |
| **Hot Liquid Line** | Shortage of refrigerant due to leak | Repair leak and recharge. |
| **Frosted Liquid Line** | Restricted filter drier | Replace filter drier. |
| **Frosted Suction Line** | Expansion valve admitting excess refrigerant (note: this is a normal condition for brine applications) | Replace valve if defective. |
| | Stuck TXV | Replace valve if defective. |
| **Freeze-Up** | Improper charging | Make sure a full quantity of fluid is flowing through the cooler while charging, and suction pressure in cooler is equal to or greater than pressure corresponding to 32 F (0° C). |
| | System not drained for winter shutdown | *Recommended that system be filled with an appropriate glycol mixture to prevent freezing of pumps and fluid tubing.* |
| | Loose thermistor | Verify thermistors are fully inserted in wells. |

## Table 32 — Alarm and Alert Codes

| ALARM/ ALERT CODE | ALARM OR ALERT | DESCRIPTION | WHY WAS THIS ALARM GENERATED? | ACTION TAKEN BY CONTROL | RESET METHOD | PROBABLE CAUSE |
|---|---|---|---|---|---|---|
| **A048** | Alarm | Circuit A Compressor Availability Alarm | Two compressors on circuit failed | Circuit shut down | Manual | Only one compressor operating. |
| **T051** | Alert | Circuit A, Compressor 1 Failure | Compressor feedback signal does not match relay state | Compressor A1 shut down. | Manual | High-pressure switch open, faulty CSB, loss of condenser flow, filter drier plugged, non-condensables, operation beyond capability. |
| **A051** | Alarm | Circuit A, Compressor 1 Failure | Respective current sensor board (CSB) feedback signal is ON when the compressor should be off | Unit shut down | Manual | High-pressure switch open, faulty CSB, loss of condenser flow, filter drier plugged, non-condensables, operation beyond capability. |
| **T052** | Alert | Circuit A, Compressor 2 Failure | Compressor feedback signal does not match relay state | Compressor A2 shut down. | Manual | High-pressure switch open, faulty CSB, loss of condenser flow, filter drier plugged, non-condensables, operation beyond capability. |
| **A052** | Alarm | Circuit A, Compressor 2 Failure | Respective current sensor board (CSB) feedback signal is ON when the compressor should be off | Unit shut down | Manual | High-pressure switch open, faulty CSB, loss of condenser flow, filter drier plugged, non-condensables, operation beyond capability. |
| **T053** | Alert | Circuit A, Compressor 3 Failure | Compressor feedback signal does not match relay state | Compressor A3 shut down. | Manual | High-pressure switch open, faulty CSB, loss of condenser flow, filter drier plugged, non-condensables, operation beyond capability. |
| **A053** | Alarm | Circuit A, Compressor 3 Failure | Respective current sensor board (CSB) feedback signal is ON when the compressor should be off | Unit shut down | Manual | High-pressure switch open, faulty CSB, loss of condenser flow, filter drier plugged, non-condensables, operation beyond capability. |
| **A060** | Alarm | Cooler Leaving Fluid Thermistor Failure | Thermistor outside range of –40 to 245 F (–40 to 118 C) | Chiller shut down immediately | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **A061** | Alarm | Cooler Entering Fluid Thermistor Failure | Thermistor outside range of –40 to 245 F (–40 to 118 C) | Chiller shut down immediately | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **T062** | Alert | Condenser Leaving Fluid Thermistor Failure | Thermistor outside range of –40 to 245 F (–40 to 118 C) | Alert only. No action taken. | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **T063** | Alert | Condenser Entering Fluid Thermistor Failure | Thermistor outside range of –40 to 245 F (–40 to 118 C) | Alert only. No action taken. | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **T068** | None | Circuit A Return Gas Thermistor Failure | If return gas sensors are enabled (RG.EN) and thermistor is outside range of –40 to 245 F (–40 to 118 C) | Circuit A shut down | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **T073** | Alert | Outside Air Thermistor Failure | Thermistor outside range of –40 to 245 F (–40 to 118 C) (if enabled) | Temperature reset disabled. Chiller runs under normal control/set points. | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **T074** | Alert | Space Temperature/Dual Chiller Thermistor Failure | Thermistor outside range of –40 to 245 F (–40 to 118 C) (if enabled) | Temperature reset disabled. Chiller runs under normal control/set points. | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **A077** | Alarm | Circuit A Saturated Suction Temperature exceeds Cooler Leaving Fluid Temperature | Faulty expansion valve, suction pressure transducer or leaving fluid thermistor. | Circuit A shutdown. | Manual | Faulty expansion valve or suction pressure transducer or leaving fluid thermistor. |
| **T079** | Alert | Lead/Lag LWT Thermistor Failure | Thermistor outside range of –40 to 245 F (–40 to 118 C) | Chiller runs as a stand alone machine | Automatic | Dual LWT thermistor failure, damaged cable/wire or wiring error. |
| **A090** | Alarm | Circuit A Discharge Pressure Transducer Failure | Outside of range (0 - 667 psig) | Circuit A shut down | Automatic | Transducer failure, poor connection to MBB, or wiring damage/error. |
| **A092** | Alarm | Circuit A Suction Pressure Transducer Failure | Outside of range (0 - 420 psig) | Circuit A shut down | Automatic | Transducer failure, poor connection to MBB, or wiring damage/error. |
| **T094** | Alert | Discharge Gas Thermistor Failure | Discharge thermistor (DTT) is either open or shorted outside of range –39.9 to 356 F (–39.9 to 180 C) | Digital compressor shut down. | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **A110** | Alarm | Circuit A Loss of Charge | If the compressors are off and discharge pressure reading is < 26 psig for 30 sec. | Circuit not allowed to start. | Manual | Refrigerant leak or transducer failure |
| **A112** | Alarm | Circuit A High Saturated Suction Temperature | Circuit saturated suction temperature pressure transducer > 70 F (21.1 C) for 5 minutes | Circuit shut down | Manual | Faulty Expansion valve, faulty suction pressure transducer or high entering fluid temperature. |
| **A114** | Alarm | Circuit A Low Suction Superheat | Suction superheat is less than 5° F (2.8 C) for 5 minutes. (if RGT installed) | Circuit A shut down. | Automatic restart after first daily occurrence. Manual restart thereafter. | Faulty expansion valve, faulty suction pressure transducer, faulty suction gas thermistor, circuit overcharged |

## Table 32 — Alarm and Alert Codes (cont)

| ALARM/ ALERT CODE | ALARM OR ALERT | DESCRIPTION | WHY WAS THIS ALARM GENERATED? | ACTION TAKEN BY CONTROL | RESET METHOD | PROBABLE CAUSE |
|---|---|---|---|---|---|---|
| **A116** | Alarm | Circuit A Low Cooler Suction Temperature | Mode 7 caused the compressor to unload 3 consecutive times with less than a 30-minute interval between each circuit shutdown. | Circuit shut down | Manual | Faulty expansion valve, low refrigerant charge, plugged filter drier, faulty suction pressure transducer, low cooler fluid flow |
| **A122** | Alarm | High Pressure Switch Trip Circuit A | High Pressure A Switch Input open to MBB | Circuit shut down | Manual | Faulty transducer/high pressure switch. |
| **A126** | Alarm | Circuit A High Head Pressure | SCT >Maximum condensing temperature from operating envelope<br>Operation outside compressor operating envelope | Circuit shut down | Automatic, only after first 3 daily occurrences. Manual reset thereafter. SCT must drop 5 F (2.8 C) before restart | Plugged filter drier unit operating outside of range. Faulty transducer/high pressure switch overcharged, low/ restricted condenser airflow (30MPA) low or loss of condenser flow (30MPW), fouled condenser (30MPW) |
| **T133** | Alert | Circuit A Low Suction Pressure | Suction pressure below 34 psig for 8 seconds or below 23 psig | Circuit shut down | Automatic restart after first daily occurrence. Manual restart thereafter. | Faulty or plugged TXV, low refrigerant charge, TXV out of adjustment, liquid line valve partially closed. Plugged filter drier. Low cooler flow. |
| **A140** | Alert | Reverse Rotation Detected | Incoming chiller power leads not phased correctly | Chiller not allowed to start. | Manual | Reverse any two incoming power leads to correct. Check for correct fan rotation first. |
| **A150** | Alarm | Emergency Stop | CCN emergency stop command received | Chiller shutdown. | Automatic once CCN command for EMSTOP returns to normal | CCN Network command. |
| **A151** | Alarm | Illegal Configuration | One or more illegal configurations exists. | Chiller is not allowed to start. | Manual once configuration errors are corrected | Configuration error. Check unit settings. |
| **A152** | Alarm | Unit Down Due to Failure | Both circuits are down due to alarms/alerts. | Chiller is unable to run. | Automatic once alarms/alerts are cleared that prevent the chiller from starting. | Alarm notifies user that chiller is 100% down. |
| **T153** | Alert | Real Time Clock Hardware Failure | Internal clock on MBB fails | Occupancy schedule will not be used. Chiller defaults to Local On mode. | Automatic when correct clock control restarts. | Time/Date/Month/ Day/Year not properly set. |
| **A154** | Alarm | Serial EEPROM Hardware Failure | Hardware failure with MBB | Chiller is unable to run. | Manual | Main Base Board failure. |
| **T155** | Alert | Serial EEPROM Storage Failure | Configuration/storage failure with MBB | No Action | Manual | Potential failure of MBB. Download current operating software. Replace MBB if error occurs again. |
| **A156** | Alarm | Critical Serial EEPROM Storage Failure | Configuration/storage failure with MBB | Chiller is not allowed to run. | Manual | Main Base Board failure. |
| **A157** | Alarm | A/D Hardware Failure | Hardware failure with peripheral device | Chiller is not allowed to run. | Manual | Main Base Board failure. |
| **T173** | Alert | Loss of Communication with EMM | MBB loses communication with EMM | 4 to 20 mA temperature reset disabled. Demand Limit set to 100%. 4 to 20 mA set point disabled. | Automatic | Wiring error, faulty wiring or failed Energy Management Module (EMM). |
| **T174** | Alert | 4 to 20 mA Cooling Set Point Input Failure | If configured with EMM and input less than 2 mA or greater than 22 mA | Set point function disabled. Chiller controls to CSP1. | Automatic | Faulty signal generator, wiring error, or faulty EMM. |
| **T175** | Alert | Loss of Communication with AUX Board | MBB losses communication with AUX board | Digital control is disabled. | Automatic | Wiring error, faulty wiring, failed AUX board, ditital option enabled, Configuration→Unit→AI.TY=YES |
| **T176** | Alert | 4 to 20 mA Temperature Reset Input Failure | If configured with EMM and input less than 2 mA or greater than 22 mA | Reset function disabled. Chiller returns to normal set point control. | Automatic | Faulty signal generator, wiring error, or faulty EMM. |
| **T177** | Alert | 4 to 20 mA Demand Limit Input Failure | If configured with EMM and input less than 2 mA or greater than 22 mA | Demand limit function disabled. Chiller returns to 100% demand limit control. | Automatic | Faulty signal generator, wiring error, or faulty EMM. |

See legend on page 46.

## Table 32 — Alarm and Alert Codes (cont)

| ALARM/ ALERT CODE | ALARM OR ALERT | DESCRIPTION | WHY WAS THIS ALARM GENERATED? | ACTION TAKEN BY CONTROL | RESET METHOD | PROBABLE CAUSE |
|---|---|---|---|---|---|---|
| **T200** | Alert | Cooler Flow/Interlock Contacts failed to Close at start-up | Cooler flow switch contacts failed to close within 1 minute (if cooler pump control is enabled) or within 5 minutes (if cooler pump control is not enabled) after start-up | Chiller not allowed to start. For models with dual pumps, the second pump will be started if available | Manual | Faulty flow switch or interlock. |
| **T201** | Alert | Cooler Flow/Interlock Contacts Opened During Normal Operation | Flow switch opens for at least 3 seconds after being initially closed | All compressors shut down. For models with dual pumps, the second pump will be started if available | Manual | Cooler pump failure, faulty flow switch or interlock. |
| **A202** | Alarm | Cooler Pump Interlock Closed When Pump is Off | If configured for cooler pump control and flow switch input is closed for 5 minutes while pump output(s) are off | Chiller not allowed to start | Automatic when aux contacts open | Wiring error, faulty pump contactor (welded contacts) |
| **T203** | Alert | Loss of Communication with slave chiller | Master chiller MBB loses communication with slave chiller MBB | Dual chiller control disabled. Chiller runs as a stand-alone machine. | Automatic | Wiring error, faulty wiring, failed Slave chiller MBB module, power loss at slave chiller, wrong slave address. |
| **T204** | Alert | Loss of Communication with master chiller | Slave chiller MBB loses communication with master chiller MBB | Dual chiller control disabled. Chiller runs as a stand-alone machine | Automatic | Wiring error, faulty wiring, failed master chiller MBB module, power loss at Master chiller. |
| **T205** | Alert | Master and slave chiller with same address | Master and slave chiller have the same CCN address (CCN.A) | Dual chiller routine disabled. Master/slave run as stand-alone chillers. | Automatic | CCN Address for both chillers is the same. Must be different. Check CCN.A under the OPT2 sub-mode in Configuration at both chillers. |
| **T206** | Alert | High Leaving Chilled Water Temperature | LWT read is greater than LCW Alert Limit, Total capacity is 100% and LWT is greater than LWT reading one minute ago | Alert only. No action taken. | Automatic | Building load greater than unit capacity, low water/brine flow or compressor fault. Check for other alarms/alerts. |
| **A207** | Alarm | Cooler Freeze Protection | Cooler EWT or LWT is less than Brine Freeze (BR.FZ) | Chiller shutdown without going through pumpdown. Cooler pump continues to run a minimum of 5 minutes (if control enabled). | Both EWT and LWT must be at least 6 F (3.3 C) above Brine Freeze point (BR.FZ). Automatic for first, Manual reset there after. | Faulty thermistor (T1/T2), low water flow. |
| **A208** | Alarm | EWT or LWT Thermistor failure | Cooler EWT is less than LWT by 3° F (1.7° C) for 1 minute after a circuit is started | Chiller shutdown. Cooler pump shut off (if control enabled). | Manual | Reverse flow faulty thermistor, miswired thermistor |
| **A220** | Alarm | Condenser Pump Interlock Failure to Close at Start-Up | If configured for condenser pump interlock and the flow switch input fails to close within 5 minutes after start-up. Also valid when configured for condenser pump control. | Condenser and cooler pumps shut off. Chiller shutdown | Manual | Failure of condenser pump or controls. Wiring error. |
| **A221** | Alarm | Condenser Pump Interlock Opened During Normal Operation | If configured for condenser pump interlock and the flow switch opens for 15 seconds during normal operation (or when the condenser pump relay is on when condenser pump control is configured.) | Condenser and cooler pumps shut off. Chiller shutdown | Manual | Failure of condenser pump or controls. Wiring error. |
| **A222** | Alarm | Condenser Pump Interlock Closed When Pump is Off | If configured for condenser pump interlock condenser pump control, and the flow switch is closed when pump relay is off. | Chiller is not allowed to start. | Manual | Failure of condenser pump relays or interlocks, welded contacts. |

**Table 32 — Alarm and Alert Codes (cont)**

| ALARM/ ALERT CODE | ALARM OR ALERT | DESCRIPTION | WHY WAS THIS ALARM GENERATED? | ACTION TAKEN BY CONTROL | RESET METHOD | PROBABLE CAUSE |
|---|---|---|---|---|---|---|
| **T302** | Alert | Strainer Blowdown Scheduled Maintenance Due | Strainer Service Countdown (S.T.DN) expired. Complete strainer blowdown and enter 'YES' for Strainer Maintenance Done (S.T.MN) item. | None | Automatic | Routine strainer maintenance required |
| **T500** | Alert | Current Sensor Board A1 Failure | Alert occurs when CSB output is a constant high value | Compressor A1 shut down | Automatic | CSB failure. |
| **T501** | Alert | Current Sensor Board A2 Failure | Alert occurs when CSB output is a constant high value | Compressor A2 shut down | Automatic | CSB failure. |
| **T502** | Alert | Current Sensor Board A3 Failure | Alert occurs when CSB output is a constant high value | Compressor A3 shut down | Automatic | CSB failure. |
| **T950** | Alert | Loss of Communication with Water System Manager | No communications have been received by the MBB within 5 minutes of last transmission | WSM forces removed. Chiller runs under own control | Automatic | Failed module, wiring error, failed transformer, loose connection plug, wrong address |
| **T951** | Alert | Loss of Communication with Chillervisor System Manager | No communications have been received by the MBB within 5 minutes of last transmission | CSM forces removed. Chiller runs under own control | Automatic | Failed module, wiring error, failed transformer, loose connection plug, wrong address |

LEGEND

**CCN** — Carrier Comfort Network
**CSB** — Current Sensor Board
**CSM** — Chiller System Manager
**EEPROM** — Electronic Eraseable Programmable Read Only Memory
**EMM** — Energy Management Module
**EWT** — Entering Fluid Temperature
**LCW** — Leaving Chilled Water
**LWT** — Leaving Fluid Temperature
**MBB** — Main Base Board
**SCT** — Saturated Condenser Temperature
**TXV** — Thermostatic Expansion Valve
**WSM** — Water System Manager

COMPRESSOR FAILURE ALERTS

A048 (Circuit A Compressor Availability Alarm) — This alarm occurs when two compressors are unavailable to run on a 3 compressor circuit. The control ensures proper oil return by ensuring a circuit does not operate with one compressor for longer than one hour of cumulative run time.

T051, T052, T053 (Circuit A Compresser Failures) — Alert codes 051, 052, and 053 are for compressors A1, A2, and A3 respectively. These alerts occur when the current sensor (CS) does not detect compressor current during compressor operation. When this occurs, the control turns off the compressor.

If the current sensor board reads OFF while the compressor relay has been commanded ON, an alert is generated.

POSSIBLE CAUSES

Compressor Overload — Either the compressor internal overload protector is open or the external overload protector (Kriwan module) has activated. The external overload protector modules are mounted in the compressor wiring junction box. Temperature sensors embedded in the compressor motor windings are the inputs to the module. The module is powered with 24 vac from the units main control box. The module output is a normally closed contact that is wired in series with the compressor contactor coil. In a compressor motor overload condition, contact opens, deenergizing the compressor contactor.

Low Refrigerant Charge — If the compressor operates for an extended period of time with low refrigerant charge, the compressor ASTP device will open, which will cause the compressor to trip on its overload protection device.

Circuit Breaker Trip — The compressors are protected from short circuit by a breaker in the control box.

Wiring Error — A wiring error might not allow the compressor to start.

To check out alerts T051-T053:

1. Turn on the compressor in question using Service Test mode. If the compressor does not start, then most likely the problem is one of the following: HPS open, open internal protection, circuit breaker trip, incorrect safety wiring, or incorrect compressor wiring.
2. If the compressor does start, verify it is rotating in the correct direction.

IMPORTANT: Prolonged operation in the wrong direction can damage the compressor. Correct rotation can be verified by a gage set and looking for a differential pressure rise on start-up.

IMPORTANT: If the CS is always detecting current, verify that the compressor is on. If the compressor is on, check the contactor and the relay on the MBB. If the compressor is off and there is no current, verify the CSB wiring and replace if necessary.

IMPORTANT: Return to Normal mode and observe compressor operation to verify that compressor current sensor is working.

COMPRESSOR STUCK ON FAILURE ALARMS

Circuit A A051, A052, A053 — Alarm codes 051, 052, and 053 are for compressors A1, A2, and A3. These alarms occur when the CSB detects current when the compressor should be off. When this occurs, the control turns off the compressor.

If the current sensor board reads ON while the compressor relay has been commanded OFF for a period of 4 continuous seconds, an alarm is generated. These alarms are only monitored for a period of 10 seconds after the compressor relay has been commanded OFF. This is done to facilitate a service technician forcing a relay to test a compressor.

In addition, if a compressor stuck failure occurs and the current sensor board reports the compressor and the request off, certain diagnostics will take place as follows:

1. If any of the compressors are diagnosed as stuck on and the current sensor board is on and the request is off, the control will command the condenser fans to maintain normal head pressure.
2. The control will shut-off all other compressors.

   The possible causes include welded contactor or frozen compressor relay on the MBB.

To check out alarms A051 to A053:

1. Place the unit in Service Test mode. All compressors should be off.
2. Verify that there is not 24-v at the contactor coil. If there is 24 v at the contactor, check relay on MBB and wiring.
3. Check for welded contactor.
4. Verify CSB wiring.
5. Return to Normal mode and observe compressor operation to verify that compressor current sensor is working and condenser fans are energized.

A060 (Cooler Leaving Fluid Thermistor Failure) — The sensor reading is outside the range of –40 to 240 F (–40 to 116 C) then the alarm will occur. The cause of the alarm is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection. Failure of this thermistor will shut down the entire unit.

A061 (Cooler Entering Thermistor Failure) — If the sensor reading is outside the range of –40 to 240 F (–40 to 116 C) then the alarm will occur. The cause of the alarm is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection. Failure of this thermistor will shut down the entire unit.

T062 (Condenser Leaving Fluid Thermistor Failure) — The sensor reading is outside the range of –40 to 240 F (–40 to 116 C) then the alert will occur. The cause of the alert is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection. Failure of this thermistor will send out an alert only.

T063 (Condenser Entering Thermistor Failure) — If the sensor reading is outside the range of –40 to 240 F (–40 to 116 C) then the alert will occur. The cause of the alert is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection. Failure of this thermistor will send out an alert only.

T068 (Circuit A Compressor Return Gas Temperature Thermistor Failure) — This alert occurs if the RGT is configured and the compressor return gas temperature sensor is outside the range of –40 to 240 F (–40 to 116 C). Failure of this thermistor will shut down the appropriate circuit.

T073 (Outside Air Temperature Thermistor Failure) — This alert occurs when the outside air temperature sensor is outside the range of –40 to 240 F (–40 to 116 C). Failure of this thermistor will disable any elements of the control which requires its use. The OAT must be configured.

T074 (Space Temperature Thermistor Failure) — This alert occurs when the space temperature sensor is outside the range of –40 to 240 F (–40 to 116 C). Failure of this thermistor will disable any elements of the control which requires its use. The cause of the alert is usually a faulty thermistor in the T55 or T58 device, a shorted or open thermistor caused by a wiring error, or a loose connection. The SPT must be configured.

A077 (Circuit Saturated Suction Temperature Exceeds Cooler Leaving Water Temperature) — This alarm occurs when the saturated suction temperature (SST) is greater than leaving water for 5 minutes. This alarm will occur if either the suction pressure transducer reading, which is used to calculate SST, or cooler leaving water is incorrect. Potential causes for this alarm are loose wiring connection, sensor not located in well or bad Schrader fitting. Reset is manual.

T079 (Dual Chiller Thermistor Failure) — This alert occurs when the dual chiller temperature sensor is outside its range of –40 to 240 F (–40 to 116 C). Failure of this thermistor will disable dual chiller operation and return to stand-alone operation. The unit must be configured for dual chiller operation for this alert to occur. The cause of the alert is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection. Reset is automatic.

A090 (Circuit A Discharge Pressure Transducer Failure) — This alarm occurs when the pressure is outside the range of 0.0 to 667.0 psig (0.0 to 4599 kPag). A circuit cannot run when this alarm is active. Use the scrolling marquee to reset the alarm. The cause of the alarm is usually a faulty transducer, faulty 5-v power supply, or a loose connection.

A092 (Circuit A Suction Pressure Transducer Failure) — This alarm occurs when the pressure is outside the range of 0.0 to 420.0 psig (0.0 to 2896 kPag). A circuit cannot run when this alarm is active. Use the scrolling marquee to reset the alarm. The cause of the alarm is usually a faulty transducer, faulty 5-v power supply, or a loose connection.

T094 (Discharge Gas Thermistor Failure) — This alert occurs for units which have the digital compressor installed on circuit A. If discharge gas temperature is open or shorted, the circuit will be shut off. The valid range for this thermistor is –39.9 to 356 F (–39.9 to 180 C). The alert will reset itself when discharge temperature is less than 250 F (121.1 C). The cause of the alert is usually low refrigerant charge or a faulty thermistor.

A110 (Circuit A Loss of Charge) — This alarm occurs when the compressor is OFF and the discharge pressure is less than 26 psig (179.2 kPa).

A112 (Circuit A High Saturated Suction Temperature) — Alarm code 112 occurs when compressors in a circuit have been running for at least 5 minutes and the circuit saturated suction temperature is greater than 70 F (21.1 C). The high saturated suction alarm is generated and the circuit is shut down.

A114 (Circuit A Low Superheat) — Alarm code 114 occurs when the superheat of a circuit is less than 5 F (2.8 C) for 5 continuous minutes. The low superheat alarm is generated and the circuit is shut down. The RGT sensor must be installed.

A116 (Circuit A Low Cooler Suction Temperature) — Alarm code 116 occurs when mode 7 causes the compressor to unload 3 consecutive times in less than 30-minute intervals between each circuit shutdown. The low cooler suction temperature alarm is generated and the circuit is shut down. If this condition is encountered, check the following items:

- check for a faulty expansion valve.
- check for a plugged filter drier.
- check for a low refrigerant charge condition.
- check the suction pressure transducer for accuracy.
- check the cooler flow rate.
- check the chilled water strainer for a restriction.
- consider a fouled cooler.
- check the glycol concentration in the loop; high glycol concentrations can cause the same effect as a fouled cooler.
- check that the water flow is in the proper direction.

A122 (Circuit A, High Pressure Switch Failure) — The high-pressure switch is wired in series with the compressor contactor coils of each compressor on the circuit to disable compressor operation immediately upon a high discharge pressure condition. The normally closed contacts in the switches are calibrated to open at 650 ± 10 psig (448.2 ± 68.9 kPag) which corresponds to a saturated condensing temperature of 155.6 ± 1.3 F (68.7 ± 0.7 C). The pressure switches will automatically reset when the discharge pressure is reduced to 500 ±

15 psig (3448 ± 103.4 kPag) which corresponds to a saturated condensing temperature of 134.1 ± 2.4 F (56.7 ± 1.3 C).

The output of the high-pressure switch is wired to inputs on the MBB to provide the control with an indication of a high pressure switch trip. This alert could occur when compressors are off if the wiring to the switch is broken or the switch has failed open.

If the high-pressure switch trips on a circuit with compressors commanded on, the discharge pressure is recorded. If the recorded discharge pressure is between 630 to 660 psig (4344 to 4451 kPa) (saturated condensing temperature between 153.0 and 156.9 F) (67.2 and 69.5 C), and is also less than the value recorded on any previous high-pressure switch trip, the upper horizontal portion of the compressor operating envelope (see Fig. 12) is lowered 0.4 F (3 psig) (0.22 C [20.7 kPa]). The control will not allow the compressor operating envelope to be lowered below 153.0 F (630 psig) (67.2 C [4344 kPa]).

This is done to make a rough calibration of the high pressure switch trip point. In most cases this allows the control to detect a high head pressure condition prior to reaching the high pressure switch trip point.

When the trip occurs, all mechanical cooling on the circuit is shut down for 15 minutes. After 15 minutes, the circuit is allowed to restart.

A126 (Circuit A High Head Pressure) — This alarm occurs when the appropriate saturated condensing temperature is greater than the operating envelope shown in Fig 12. Prior to the alarm, the control will shut down one compressor on a circuit if that circuit's saturated condensing temperature is greater than the maximum SCT minus 5° F (2.7° C). If SCT continues to rise to greater than the maximum SCT, the alarm will occur and the circuit's remaining compressor will shut down. The cause of the alarm is usually an overcharged system, high outdoor ambient temperature coupled with dirty outdoor coil (30MPA only), plugged filter drier, a faulty high-pressure switch, or loss of condenser water flow.

T133 (Circuit A Low Suction Pressure) — This alert indicates that after the compressor has been running for 1 minute one of the following has occured: suction pressure is below 34 psig (234 kPa), saturated suction temperature is less than 12 F (–24.4 C) for 8 seconds or the suction presure falls below 23 psig (158 kPa), saturated temperature is less than –18 F (–27.8 C). The Circuit A low suction pressure alert occurs and the circuit is shut down. The reset function will occur automatically for the first daily occurance and manually (MBB) for each reoccurance.

If this condition is encountered, check the following items:

- Check the unit refrigeration charge, a low charge condition can cause low suction pressures.
- Check the TXV operation.
- Check the liquid line service valve to be sure that it is fully open.
- Check the liquid line filter drier for a restriction.
- Check the head pressure control device. For 30MPA units, check the remote condenser to be sure that it is operating correctly. If the remote condenser does not have head pressure control, consider adding it. For 30MPW units, check the condenser water regulating valve for proper operation. If the unit does not have head pressure control, consider adding one, or adjusting the loop temperature.

A140 (Reverse Rotation Detected) — A test is made once, on power up, for suction pressure change on the first activated circuit. The unit control determines failure as follows:

1. The suction pressure is sampled 5 seconds before the compressor is brought on, right when the compressor is brought on and 5 seconds afterwards.
2. The rate of suction pressure change from 5 seconds before the compressor is brought on to when the compressor is brought on is calculated.
3. The rate of suction pressure change from when the compressor is brought on to 5 seconds afterwards is calculated.
4. With the above information, the test for reverse rotation is made. If the suction pressure change 5 seconds after compression is greater than the suction pressure change 5 seconds before compression – 1.25, then there is a reverse rotation error.

This alarm will disable mechanical cooling and will require manual reset. This alarm may be disabled once the reverse rotation check has been verified by setting ***Configuration→SERV→REV.R = DSBL***.

A150 (Unit is in Emergency Stop) — If the CCN emergency stop command is received, the alarm is generated and the unit will be immediately stopped.

If the CCN point name "EMSTOP" in the system table is set to emergency stop, the unit will shut down immediately and broadcast an alarm back to the CCN, indicating that the unit is down. This alarm will clear when the variable is set back to "enable."

A151 (Illegal Configuration) — An A151 alarm indicates an invalid configuration has been entered. The following are illegal configurations.

- Invalid unit size has been entered.
- Unit configuration set to invalid type.

A152 (Unit Down Due to Failure) — Reset is automatic when all alarms are cleared. This alarm indicates the unit is at 0% capacity.

T153 (Real Time Clock Hardware Failure) — A problem has been detected with MBB real time clock hardware. Try resetting the power and check the indicator lights. If the alert continues, the board should be replaced.

A154 (Serial EEPROM Hardware Failure) — A problem has been detected with the EEPROM on the MBB. Try resetting the power and check the indicator lights. If the alarm continues, the board should be replaced.

T155 (Serial EEPROM Storage Failure Error) — A problem has been detected with the EEPROM storage on the MBB. Try resetting the power and check the indicator lights. If the alert continues, the board should be replaced.

A156 (Critical Serial EEPROM Storage Failure Error) — A problem has been detected with the EEPROM storage on the MBB. Try resetting the power and check the indicator lights. If the alarm continues, the board should be replaced.

A157 (A/D Hardware Failure) — A problem has been detected with A/D conversion on the boards. Try resetting the power and check the indicator lights. If the alarm continues, the board should be replaced.

T173 (Energy Management Module Communication Failure) — This alert indicates that there are communications problems with the energy management. All functions performed by the EMM will stop, which can include demand limit, reset and capacity input. The alert will automatically reset.

T174 (4 to 20 mA Cooling Set point Input Failure) — This alert indicates a problem has been detected with cooling set point 4 to 20 mA input. The input value is either less than 2 mA or greater than 22 mA.

T175 (Loss of Communication with the AUX Board) — This alert will be generated when the Main Base Board (MBB) loses communication with the AUX Board. The digital control option will be disabled while this alert is active. The chiller continues to run without Digital Compressor Control. The alert will reset automatically if communication is re-established or

the unit configuration for digital control, ***A1.TY*** Compressor A1 Digital?→(***Configuration Mode→UNIT***) = NO.

If this condition is encountered, check the following items:

- Check for a wiring error.
- Check for a faulty communication bus, or no connection to the AUX Board.
- Check the AUX Board
- If the unit it is configured for digital control, ***A1.TY*** Compressor A1 Digital?→(***Configuration Mode→UNIT***) is YES, but the unit is not a Digital Capacity machine, (no digital compressor or AUX Board), this alarm will be generated.

T176 (4 to 20 mA Reset Input Failure) — This alert indicates a problem has been detected with reset 4 to 20 mA input. The input value is either less than 2 mA or greater than 22 mA. The reset function will be disabled when this occurs.

T177 (4 to 20 mA Demand Limit Input Failure) — This alert indicates a problem has been detected with demand limit 4 to 20 mA input. The input value is either less than 2 mA or greater than 22 mA. The reset function will be disabled when this occurs.

T200 (Cooler Flow Interlock Contacts Failed to Close at Start-Up Alert) — This alert indicates the cooler flow switch interlock contacts failed to close within 1 minute, if cooler pump control is enabled or within 5 minutes, if cooler pump control is not enabled after start-up. If the unit is equipped with dual pumps, the second pump will be started and time allowed to prove flow before the unit is alarmed. The cooler flow/cooler pump interlock contacts failed to close at start-up alert is generated and the chiller is not allowed to start.

If this condition is encountered, check the following items:

- Check the chilled water flow switch for proper operation.
- Check the flow switch cable for power and control.
- Check the chilled water loop to be sure that it is completely filled with water, and all air has been purged.
- Check the chilled water pump interlock circuit for proper operation.
- Check the pump electrical circuit for power.
- Check the pump circuit breaker.
- Check the pump contactor for proper operation.
- Check the chilled water pump for proper operation. Look for overload trips.
- Check the chilled water strainer for a restriction.
- Check to be sure that all isolation valves are open completely.

P201 (Cooler Flow/Interlock Contacts Opened During Normal Operation Pre-alarm)

T201 (Cooler Flow/Interlock Contacts Opened During Normal Operation Alert) — This alert will be generated for the appropriate pump if the chilled water flow switch opens for at least three (3) seconds after initially being closed, and an P201 - Cooler Flow/Interlock Contacts Opened During Normal Operation Alarm will be generated and the machine will stop. If available, the other pump will be started. If flow is proven, the machine will be allowed to restart. If after 5 minutes, the cooler flow switch/interlock contacts do not close, the alarm will change to a T201 - Cooler Flow/Interlock Contacts Opened During Normal Operation Alert. When this alert is generated the chiller is shut down.

If this condition is encountered, check the following items:

- Check the chilled water flow switch for proper operation.
- Check the flow switch cable for power and control.
- Check the chilled water loop to be sure that it is completely filled with water, and all air has been purged.
- Check the chilled water pump interlock circuit for proper operation.
- Check the pump electrical circuit for power.
- Check the pump circuit breaker.
- Check the pump contactor for proper operation.
- Check the chilled water pump for proper operation. Look for overload trips.
- Check the chilled water strainer for a restriction.
- Check to be sure that all isolation valves are open completely.

A202 (Cooler Pump Interlock Closed When Pump Is Off Alarm) — This alarm will be generated if the unit is configured for ***CPC=ON*** Cooler Pump Control, (***Configuration→OPT1***) without a call for the Chilled Water Pump, ***C.LWP=OFF*** (***Outputs→GEN.O***) and the chilled water switch is closed, ***FLOW=ON*** Cooler Flow Switch (Inputs→***GEN.I***) for 5 minutes. When this alarm is generated the chiller is not allowed to start.

If this condition is encountered, check the following items:

- Check for a wiring error for the chilled water flow switch, the chilled water flow switch's connection to the MBB or a wiring error to the chilled water pump.
- Check to see if the chilled water pump control has been manually bypassed.
- Check for a faulty or grounded chilled water flow switch.
- Check chilled water pump contactor for welded contacts.

T203 (Loss of Communication with the Slave Chiller Alert) — This alert will be generated if Dual Chiller Control is enabled, ***LLEN*=ENBL** Lead/Lag Chiller Enable (C***onfiguration→RSET***), the chiller has been configured to be the Master Chiller ***MSSL*=MAST** Master/Slave Select (***Configuration→RSET***) and it has not established or lost communication with the Slave Chiller. When this alert is generated the dual chiller control will be disabled and the unit will operate in stand-alone mode.

If this condition is encountered, check the following items:

- Check the communication wiring between the two chillers is proper and is not grounded.
- Check to be sure that both the Master and Slave Chillers are on the same bus, ***CCNB*** CCN Bus Number (***Configuration→CCN***).
- Check to be sure that the slave chiller address ***CCNA*** CCN Address (***Configuration→CCN***) matches what is programmed in the master chiller's configuration for slave address. ***SLVA*** Slave Address (***Configuration→RSET***).
- Check for power at the slave chiller. If power is not present, this alarm will be generated.
- Check for a faulty master or slave MBB. If CCN communications is not working, this alarm will be generated.

T204 (Loss of Communication with the Master Chiller Alert) — This alert will be generated if Dual Chiller Control is enabled, ***LLEN*=ENBL** Lead/Lag Chiller Enable (***Configuration→RSET***), the chiller has been configured to be the Slave Chiller ***MSSL*=SLVE** Master/Slave Select (***Configuration→RSET***) and it has not established or lost communication with the Master Chiller. When this alert is generated the dual chiller control will be disabled and the unit will operate in stand-alone mode.

If this condition is encountered, check the following items:

- Check the communication wiring between the two chillers is proper and is not grounded.
- Check to be sure that both the master and slave chillers are on the same bus, ***CCNB*** CCN Bus Number (***Configuration→CCN***).
- Check to be sure that the slave chiller address ***CCNA*** CCN Address (***Configuration→CCN***) matches what is programmed in the master chiller's configuration for slave address. ***SLVA*** Slave Address (***Configuration→RSET***).
- Check for power at the master chiller. If power is not present, this alarm will be generated.

- Check for a faulty master or slave MBB. If CCN communications is not working, this alarm will be generated.

T205 (Master and Slave Chiller with Same Address Alert) — This alert will be generated if Dual Chiller Control is enabled, ***LLEN***=**ENBL** Lead/Lag Chiller Enable (***Configuration→RSET***), the chiller has been configured to be the Master Chiller ***MSSL***=**MAST** Master/Slave Select (***Configuration→RSET***) and both the master chiller and slave chiller have the same address, ***CCNA*** CCN Address (***Configuration→CCN***). When this alert is generated the dual chiller control will be disabled and both units, master and slave, will operate in stand-alone mode.

If this condition is encountered, check to be sure that the Slave Chiller address ***CCNA*** CCN Address (***Configuration→CCN***) matches what is programmed in the Master Chiller's configuration for slave address. ***SLVA*** Slave Address (***Configuration→RSET***).

T206 (High Leaving Chilled Water Temperature Alert) — The criterion for this alert is checked when the unit is ON and the total available capacity is 100%. The alert is generated when the leaving chilled water temperature is greater than the ***LCWT***, High LCW Alert Limit (***Configuration→OPT2***) plus the control point and the leaving chilled water temperature is higher than it was 1 minute before the current reading. The LCWT is a delta temperature, not an absolute value. The alert will automatically reset when the leaving water temperature is less than the control point, or is less than the control point plus LCWT minus 5°F (2.8°C).

If this condition is encountered:

- Check building load.
- Check the ***LCWT***, High LCW Alert Limit (***Configuration→OPT2***) value.
- Check compressor operation.
- Check water flow.

A207 (Cooler Freeze Protection Alarm) — This alarm will be generated when the leaving water temperature is below ***BR.FZ***, Brine Freeze Point (***Set Point Mode→FRZ***). When this condition is encountered, the machine will enter Mode 16, and the Chilled Water Pump relay will be energized, even if the ***CPC*** Cooler Pump Control (***Configuration Mode→OPT1***) is OFF. If the machine is equipped with a pump, the pump will run for a minimum of 5 minutes. The unit will be shut down or prevented from starting.

The control will allow the machine to reset automatically if the leaving chilled water temperature rises above the ***BR.FZ*** Brine Freeze Point (***Set Point Mode→FRZ***) plus 6°F (3.3°C). If the alarm is generated again during the same day, it shall be a manual reset.

If this condition is encountered, check the following items:

- Check the entering or leaving water thermistor for accuracy.
- Check water flow rate.
- Check for freezing conditions.
- Check the heat tape and other freeze protection means for proper operation.
- Check glycol concentration and adjust ***BR.FZ*** accordingly.

A208 (EWT or LWT Thermistor Failure Alarm) — This alarm will be generated if the entering water temperature, ***EWT*** Entering Fluid Temp (***Run Status→VIEW***) is less than the leaving water temperature, ***LWT*** Leaving Fluid Temp (***Run Status→VIEW***) by 3°F (1.7°C) or more for 1 minute after the circuit has started. When this alarm is generated the chiller is shut down and prevented from starting. Chilled water pump is also shut down.

If this condition is encountered, check the following items:

- Check for a correct chilled water flow.
- Check the entering and leaving water thermistors for accuracy.
- Check to be sure the entering and leaving water thermistors are correctly wired and installed in the proper location.

A220 (Condenser Pump Interlock Failure to Close At Start-Up Alarm) — This alarm will be generated if the unit is configured for ***D.FL.S***=**ENBL** Enable Cond Flow Switch (***Configuration→OPT1***) and condenser flow interlock (if used) circuit fails to close within 5 minutes of the condenser pump start. When this alarm is generated the chiller is prevented from starting or will be shut down; condenser and chilled water pumps are shut down.

If this condition is encountered, check the following items:

- Check for a condenser pump failure.
- Check for power at the condenser pump.
- Check condenser pump control wiring
- Check condenser strainer for a restriction. Flush or replace as necessary.
- Check the condenser water flow switch operation.
- Check condenser water flow switch wiring.
- If the unit utilizes a flow regulating valve for head pressure control, consider disabling condenser flow switch feature.

A221 (Condenser Pump Interlock Opened During Normal Operation Alarm) — If the unit is configured for ***D.FL.S***=**ENBL** Enable Cond Flow Switch (***Configuration→OPT1***) and condenser flow interlock (if used) circuit was established and opens for 15 seconds. When this alarm is generated the chiller is prevented from starting or will be shut down; condenser and chilled water pumps are shut down.

If this condition is encountered, check the following items:

- Check for a condenser pump failure.
- Check for power at the condenser pump.
- Check condenser pump control wiring
- Check condenser strainer for a restriction. Flush or replace as necessary.
- Check the condenser water flow switch operation.
- Check condenser water flow switch wiring.
- If the unit utilizes a flow regulating valve for head pressure control, consider disabling this feature.

A222 (Condenser Pump Interlock Closed When Pump is Off Alarm) — If the unit is configured for Condenser Pump Control, ***D.PM.E*** Enable Condenser Pump (***Configuration→OPT1***) is **1** (On when Occupied) or **2** (On with Compressor), the Condenser Flow Switch is enabled, ***D.FL.S***=**ENBL** Enable Cond Flow Switch (***Configuration→OPT1***) and condenser flow interlock (if used) circuit is closed while the pump is commanded off, this alarm will be generated. When this alarm is generated the chiller is prevented from starting.

If this condition is encountered, check the following items:

- Check for a welded condenser pump contactor.
- Check for a faulty condenser pump relay
- Check for a wiring error.

T302 (Strainer Blowdown Scheduled Maintenance Due) — This alert is generated when the ***S.T.DN*** Strainer Service Countdown (***Run Status→PM***) has expired. Be sure date is correctly set: ***MNTH*** Month of Year, ***DAY*** Day of Month, and ***YEAR*** Year of Century (***Time Clock→DATE***). Complete the strainer blowdown. Set **S.T.MN** Strainer Maintenance Done (***Run Status→PM***) to ***YES***. Then reset the alert.

If this condition is encountered, check the following item:

- Strainer maintenance is required.

T500, T501, T502 (Current Sensor Board Failure — A xx Circuit A — Alert codes 500, 501, and 502 are for compressors A1, A2, and A3 respectively. These alerts occur when the output of the CSB is a constant high value. These alerts reset

automatically. If the problem cannot be resolved, the CSB must be replaced.

T950 (Loss of Communication with Water System Manager) — This alert will be generated if no communications have been received by the Main Base Board for five (5) minutes. When this occurs the Water System Manager (WSM) forces are removed. The chiller runs in stand-alone mode.

If this condition is encountered, check the following items:

- Check CCN wiring.
- Check for power at the water system manager.
- Check Main Base Board for a communication failure.

T951 (Loss of Communication with Chillervisor System Manager) — This alarm will be generated if no communications have been received by the Main Base Board for five (5) minutes. When this alert is generated the Chillervisor System Manager (CSM) forces are removed, and chiller runs in stand-alone mode.

If this condition is encountered, check the following items:

- Check CCN wiring.
- Check for power at the Chillervisor System Manager.
- Check Main Base Board for a communication failure.

# APPENDIX A — LOCAL DISPLAY TABLES

## Run Status Mode and Sub-Mode Directory

| ITEM | EXPANSION | RANGE | UNITS | CCN POINT | COMMENT |
|---|---|---|---|---|---|
| ***VIEW*** | AUTO VIEW OF RUN STATUS | | | | |
| ***→EWT*** | Entering Fluid Temp | | xxx.x °F (°C) | EWT | |
| ***→LWT*** | Leaving Fluid Temp | | xxx.x °F (°C) | LWT | |
| ***→SETP*** | Active Setpoint | | xxx.x °F | SP | |
| ***→CTPT*** | Control Point | | xxx.x °F | CTRL_PNT | |
| ***→LOD.F*** | Load/Unload Factor | | xxx | SMZ | |
| ***→STAT*** | Control Mode | | x | STAT | |
| ***→OCC*** | Occupied | | NO/YES | OCC | |
| ***→MODE*** | Override Modes in Effect | | NO/YES | MODE | |
| ***→CAP*** | Percent Total Capacity | | xxx | CAP_T | |
| ***→DEM.L*** | Active Demand Limit | | | DEM_LIM | |
| ***→STGE*** | Requested Stage | | x | STAGE | |
| ***→ALRM*** | Current Alarms and Alerts | | xxx | ALRMALRT | |
| ***→TIME*** | Time of Day | 00:00-23:59 | xx.xx | TIMECOPY | |
| ***→MNTH*** | Month of Year | 1 - 12 (1 = January, 2 = February, etc.) | xx | MOY | |
| ***→DATE*** | Day of Month | 01-31 | xx | DOM | |
| ***→YEAR*** | Year of Century | | xx | YOCDISP | |
| ***RUN*** | UNIT RUN HOUR AND START | | | | |
| ***→HRS.U*** | Machine Operating Hours | 0 to 999999 | xxxx HRS | HR_MACH | |
| ***→STR.U*** | Machine Starts | 0 to 1000000 | xxxx | CY_MACH | |
| ***→HR.P1*** | Cooler Pump Run Hours | 0 to 999999.9 | xxxx HRS | HR_CPUMP | |
| ***→HR.P2*** | Condenser Pump Run Hours | 0 to 999999.9 | xxxx HRS | HR_DPUMP | |
| ***HOUR*** | CIRC AND COMP RUN HOURS | | | | |
| ***→HR.A1*** | Compressor A1 Run Hours | 0 to 999999 | xxxx HRS | HOURS_A1 | |
| ***→HR.A2*** | Compressor A2 Run Hours | 0 to 999999 | xxxx HRS | HOURS_A2 | |
| ***→HR.A3*** | Compressor A3 Run Hours | 0 to 999999 | xxxx HRS | HOURS_A3 | |
| ***STRT*** | COMPRESSOR STARTS | | | | |
| ***→ST.A1*** | Compressor A1 Starts | 0 to 999999 | xxxx | CY_A1 | |
| ***→ST.A2*** | Compressor A2 Starts | 0 to 999999 | xxxx | CY_A2 | |
| ***→ST.A3*** | Compressor A3 Starts | 0 to 999999 | xxxx | CY_A3 | |
| ***PM*** | PREVENTIVE MAINTENANCE | | | | |
| ***→STRN*** | STRAINER MAINTENANCE | | | | |
| ***→STRN→SI.ST*** | Strainer Srvc Interval | | xxxx HRS | SI_STRNR | |
| ***→STRN→S.T.DN*** | Strainer Srvc Countdown | 0 to 65535 | xxxx HRS | ST_CDOWN | Default: 8760 |
| ***→STRN→S.T.MN*** | Strainer Maint. Done | 0 to 65535 | NO/YES | ST_MAINT | |
| ***→ST.DT*** | STRAINER MAINT. DATES | | | | |
| ***→ST.DT→S.T.M0*** | | | MM/DD/YY HH:MM | | |
| ***→ST.DT→S.T.M1*** | | | MM/DD/YY HH:MM | | |
| ***→ST.DT→S.T.M2*** | | | MM/DD/YY HH:MM | | |
| ***→ST.DT→S.T.M3*** | | | MM/DD/YY HH:MM | | |
| ***→ST.DT→S.T.M4*** | | | MM/DD/YY HH:MM | | |
| ***VERS*** | SOFTWARE VERSION NUMBERS | | | | |
| ***→MBB*** | CESR131482-xx-xx | | | | |
| ***→AUX1**** | CESR131333-xx-xx | | | | |
| ***→EMM**** | CESR131174-xx-xx | | | | |
| ***→MARQ*** | CESR131171-xx-xx | | | | |
| ***→NAVI**** | CESR130227-xx-xx | | | | |

* If these devices are not installed, they will not show in the table.

## Service Test Mode and Sub-Mode Directory

| ITEM | EXPANSION | RANGE | UNITS | CCN POINT | COMMENT |
|---|---|---|---|---|---|
| ***TEST*** | SERVICE TEST MODE | | OFF/ON | MAN_CTRL | To enable Service Test mode, move Enable/Off/ Remote contact switch to OFF. Change TEST to ON. Move switch to ENABLE. |
| ***OUTS*** | OUTPUTS AND PUMPS | | | | |
| ***→CLR.P*** | Cooler Pump Relay | | OFF/ON | S_CLPMP | |
| ***→CND.P*** | Condenser Pump | | OFF/ON | S_CNDPMP | |
| ***→UL.TM*** | Comp A1 Unload Time | 0 to 15 | xx | S_A1ULTM | |
| ***→CC.H*** | Crankcase Heater | | OFF/ON | S_CCH | |
| ***→CW.VO*** | Condenser Valve Open | | OFF/ON | S_CWVO | not supported |
| ***→CW.VC*** | Condenser Valve Close | | OFF/ON | S_CWVC | not supported |
| ***→LL.SV*** | Liquid Line Solenoid | | OFF/ON | S_LLSV | |
| ***→RMT.A*** | Remote Alarm Relay | | OFF/ON | S_ALM | |
| ***CMPA*** | CIRCUIT 1 COMPRESSOR TST | | | | |
| ***→CC.A1*** | Compressor A1 Relay | | OFF/ON | S_A1_RLY | |
| ***→UL.TM*** | Comp A1 Unload Time | 0 to 15 | xx | S_A1ULTM | |
| ***→CC.A2*** | Compressor A2 Relay | | OFF/ON | S_A2_RLY | |
| ***→CC.A3*** | Compressor A3 Relay | | OFF/ON | S_A3_RLY | |
| ***→MLV*** | Minimum Load Valve Relay | | OFF/ON | S_MLV | |

# APPENDIX A — LOCAL DISPLAY TABLES (cont)

## Temperature Mode and Sub-Mode Directory

| ITEM | EXPANSION | UNITS | CCN POINT | COMMENT |
|---|---|---|---|---|
| ***UNIT*** | ENT AND LEAVE UNIT TEMPS | | | |
| ***→CEWT*** | Cooler Entering Fluid | xxx.x °F | COOL_EWT | |
| ***→CLWT*** | Cooler Leaving Fluid | xxx.x °F | COOL_LWT | |
| ***→CDET*** | Condenser Entering Fluid | xxx.x °F | COND_EWT | |
| ***→CDLT*** | Condenser Leaving Fluid | xxx.x °F | COND_LWT | |
| ***→OAT*** | Outside Air Temperature | xxx.x °F | OAT | |
| ***→SPT*** | Space Temperature | xxx.x °F | SPT | |
| ***→DLWT*** | Lead/Lag Leaving Fluid | xxx.x °F | DUAL_LWT | |
| ***CIR.A*** | TEMPERATURES CIRCUIT A | | | |
| ***→SCT.A*** | Saturated Condensing Tmp | xxx.x °F | TMP_SCTA | |
| ***→SST.A*** | Saturated Suction Temp | xxx.x °F | TMP_SSTA | |
| ***→RGT.A*** | Compr Return Gas Temp | xxx.x °F | TMP_RGTA | |
| ***→D.GAS*** | Discharge Gas Temp | xxx.x °F | DISGAS | |
| ***→SH.A*** | Suction Superheat Temp | xxx.x ΔF | SH_A | |

## Pressures Mode and Sub-Mode Directory

| ITEM | EXPANSION | UNITS | CCN POINT | COMMENT |
|---|---|---|---|---|
| ***PRC.A*** | PRESSURES CIRCUIT A | | | |
| ***→DP.A*** | Discharge Pressure | xxx.x PSIG | DP_A | |
| ***→SP.A*** | Suction Pressure | xxx.x PSIG | SP_A | |

## Set Points Mode and Sub-Mode Directory

| ITEM | EXPANSION | RANGE | UNITS | CCN POINT | DEFAULT |
|---|---|---|---|---|---|
| ***COOL*** | COOLING SETPOINTS | | | | |
| ***→CSP.1*** | Cooling Setpoint 1 | –20 to 70°F (–28.9 to 21.1°C) | xxx.x °F | CSP1 | 44°F (6.6°C) |
| ***→CSP.2*** | Cooling Setpoint 2 | –20 to 70°F (–28.9 to 21.1°C) | xxx.x °F | CSP2 | 44°F (6.6°C) |
| ***→CSP.2*** | ICE Setpoint | –20 to 32°F (–28.9 to 0.0°C) | xxx.x °F | CSP3 | 32°F (0°C) |
| ***HEAD*** | HEAD PRESSURE SETPOINTS | | | | |
| ***→H.DP*** | Head Setpoint | 85 to 120°F (29.4 to 48.9°C) | xxx.x °F | HSP | 95°F (35°C) |
| ***FRZ*** | BRINE FREEZE SETPOINT | | | | |
| ***→BR.FZ*** | Brine Freeze Point | –20 to 34°F (–28.9 to 1.1°C) | xxx.x °F | BRN_FRZ | 34°F (1.1°C) |

## Inputs Mode and Sub-Mode Directory

| ITEM | EXPANSION | UNITS | CCN POINT | COMMENT |
|---|---|---|---|---|
| ***GEN.I*** | GENERAL INPUTS | | | |
| ***→STST*** | Start/Stop Switch | STRT/STOP | START | |
| ***→FLOW*** | Cooler Flow Switch | OFF/ON | COOLFLOW | |
| ***→CD.FL*** | Condenser Flow Switch | OFF/ON | CONDFLOW | |
| ***→DLS1*** | Demand Limit Switch 1 | OFF/ON | DMD_SW1 | |
| ***→DLS2*** | Demand Limit Switch 2 | OFF/ON | DMD_SW2 | |
| ***→ICED*** | Ice Done | OFF/ON | ICE_DONE | |
| ***→DUAL*** | Dual Setpoint Switch | OFF/ON | DUAL_IN | |
| ***CRCT*** | CIRCUIT INPUTS | | | |
| ***→FKA1*** | Compressor A1 Feedback | OFF/ON | K_A1_FBK | |
| ***→FKA2*** | Compressor A2 Feedback | OFF/ON | K_A2_FBK | |
| ***→FKA3*** | Compressor A3 Feedback | OFF/ON | K_A3_FBK | |
| ***→HPS.A*** | High Pressure Switch A | OFF/ON | HPSA | |
| ***4-20*** | 4-20 MA INPUTS | | | |
| ***→DMND*** | 4-20 ma Demand Signal | xx.x | LMT_MA | |
| ***→A.DL*** | Active Demand Limit | | DEM_LIM | |
| ***→RSET*** | 4-20 ma Reset Signal | xx.x | RST_MA | |
| ***→D.RST*** | Degrees of Reset | | DEG_RST | |
| ***→CSP*** | 4-20 ma Cooling Setpoint | xx.x | CSP_IN | |

## Outputs Mode and Sub-Mode Directory

| ITEM | EXPANSION | UNITS | CCN POINT | COMMENT |
|---|---|---|---|---|
| ***GEN.O*** | GENERAL OUTPUTS | | | |
| ***→C.LWP*** | Cooler Pump Relay | OFF/ON | COOLPUMP | |
| ***→C.DWP*** | Condenser Pump | OFF/ON | CONDPUMP | |
| ***→ALRM*** | Alarm State | OFF/ON | ALM | |
| ***→CD.W.O**** | Condenser Valve Open | OFF/ON | COND_WVO | |
| ***→CD.W.C**** | Condenser Valve Close | OFF/ON | COND_WVC | |
| ***CIR.A*** | OUTPUTS CIRCUIT A | | | |
| ***→CC.A1*** | Compressor A1 Relay | OFF/ON | K_A1_RLY | |
| ***→D.PER*** | Compressor A1 Load Percent | OFF/ON | DIGITALP | |
| ***→CC.A2*** | Compressor A2 Relay | OFF/ON | K_A2_RLY | |
| ***→CC.A3*** | Compressor A3 Relay | OFF/ON | K_A3_RLY | |
| ***→CCH*** | Crankcase Heater Relay | OFF/ON | CCH_RLY | |
| ***→LLSV*** | Liquid Line Solenoid | OFF/ON | LLSV_A | |
| ***→MLV.R*** | Minimum Load Valve Relay | OFF/ON | MLV_RLY | |

* Not supported.

# APPENDIX A — LOCAL DISPLAY TABLES (cont)

## Configuration Mode and Sub-Mode Directory

| ITEM | EXPANSION | RANGE | UNITS | CCN POINT | DEFAULT |
|---|---|---|---|---|---|
| ***DISP*** | DISPLAY CONFIGURATION | | | | |
| →***TEST*** | Test Display LEDs | OFF/ON | | DISPTEST | |
| →***METR*** | Metric Display | OFF = English<br>ON = Metric | | DISPUNIT | OFF = English |
| →***LANG*** | Language Selection | 0 = English<br>1 = Espanol<br>2 = Francais<br>3 = Portuguese | X | LANGUAGE | 0 |
| →***PAS.E*** | Password Enable | DSBL/ENBL | | PASS_EBL | ENBL |
| →***PASS*** | Service Password | 0 to 9999 | XXXX | PASSCOPY | 1111 |
| ***UNIT*** | UNIT CONFIGURATION | | | | |
| →***TYPE*** | Unit Type | 2=Air Cooled,<br>3=Water Cooled | X | UNIT_TYP | |
| →***SIZE*** | Unit Size | 15 to 45 | XXX | SIZE | |
| →***SZA.1*** | Compressor A1 Size | Unit Size Dependent | XX | SIZE_A1 | |
| →***SZA.2*** | Compressor A2 Size | Unit Size Dependent | XX | SIZE_A2 | |
| →***SZA.3*** | Compressor A3 Size | Unit Size Dependent | XX | SIZE_A3 | |
| →***A1.TY*** | Compressor A1 Digital? | NO/YES | | CPA1TYPE | |
| →***MAX.T*** | Maximum A1 Unload Time | 0 to 15 | XX | MAXULTME | 7 (040,045)<br>10 (015,020,030) |
| ***OPT1*** | UNIT OPTIONS 1 HARDWARE | | | | |
| →***FLUD*** | Cooler Fluid | 1 = Water<br>2 = Medium Temp Brine | X | FLUIDTYP | 1 = Water |
| →***MLV.S*** | Minimum Load Vlv Select | NO/YES | | MLV_FLG | NO |
| →***RG.EN*** | Return Gas Sensor Enable | DSBL/ENBL | | RGT_ENA | |
| →***OAT.E*** | Enable OAT Sensor | DSBL/ENBL | | OAT_ENA | |
| →***CSB.E*** | CSB Boards Enable | DSBL/ENBL | | CSB_ENA | |
| →***CPC*** | Cooler Pump Control | OFF/ON | | CPC | ON |
| →***PM.DY*** | Cooler Pump Shutdown Dly | 0 to 10 | XX MIN | PUMP_DLY | 1 MIN |
| →***D.PM.E*** | Enable Condenser Pump | 0=No Control<br>1=On When Occupied<br>2=On with Compressors | X | CONDPMPE | 0=No Control |
| →***D.FL.S*** | Enable Cond Flow Switch | DSBL/ENBL | | CONDFLSW | DSBL |
| →***CDWS*** | Enable Cond Wtr Sensors | DSBL/ENBL | | CONDWTRS | DSBL |
| ***OPT2*** | UNIT OPTIONS 2 CONTROLS | | | | |
| →***CTRL*** | Control Method | 0=Switch<br>1=Occupancy<br>2=Occupancy<br>3=CCN | X | CONTROL | 0=Switch |
| →***LCWT*** | High LCW Alert Limit | 2 to 60°F<br>(1.1 to 33.3°C) | XX | LCW_LMT | 60°F (33.3°C) |
| →***DELY*** | Minutes Off Time | 0 to 15 | XX | DELAY | 0 |
| →***ICE.M*** | Ice Mode Enable | DSBL/ENBL<br>(Requires EMM) | | ICE_CNFG | DSBL |
| ***CCN*** | CCN NETWORK CONFIGS | | | | |
| →***CCNA*** | CCN Address | 1 to 239 | XXX | CCNADD | 1 |
| →***CCNB*** | CCN Bus Number | 0 to 239 | XXX | CCNBUS | 0 |
| →***BAUD*** | CCN Baud Rate | 1 = 2400<br>2 = 4800<br>3 = 9600<br>4 =19,200<br>5 =38,400 | X | CCNBAUDD | 3 = 9600 |

# APPENDIX A — LOCAL DISPLAY TABLES (cont)

## Configuration Mode and Sub-Mode Directory (cont)

| ITEM | EXPANSION | RANGE | UNITS | CCN POINT | DEFAULT |
|---|---|---|---|---|---|
| ***RSET*** | RESET COOL TEMP | | | | |
| →***CRST*** | Cooling Reset Type | 0 = No Reset<br>1 = 4 to 20 mA Input<br>2 = Outdoor Air Temperature<br>3 = Return Fluid<br>4 = Space Temperature | X | CRST_TYP | 0 = No Reset |
| →***MA.DG*** | 4-20 - Degrees Reset | –30 to 30ΔF (–16.6 to 16.6ΔC) | XX.XΔF | MA_DEG | 10.0ΔF( 5.5ΔC) |
| →***RM.NO*** | Remote - No Reset Temp | 0 to 125°F (–17.8 to 51.7°C) | XXX.X °F | REM_NO | 10.0°F (–23.3°C) |
| →***RM.F*** | Remote - Full Reset Temp | 0 to 125°F (–17.8 to 51.7°C) | XXX.X °F | REM_FULL | 0.0°F (–17.8°C) |
| →***RM.DG*** | Remote - Degrees Reset | –30 to 30ΔF (–16.6 to 16.6ΔC) | XX.X ΔF | REM_DEG | 0.0ΔF (0.0ΔC) |
| →***RT.NO*** | Return - No Reset Temp | 0 to 30ΔF (0 to 16.6ΔC) | XXX.XΔF | RTN_NO | 10ΔF (5.5ΔC) |
| →***RT.F*** | Return - Full Reset Temp | 0 to 10ΔF (0 to 5.5ΔC) | XXX.XΔF | RTN_FULL | 0.0ΔF (0.0ΔC) |
| →***RT.DG*** | Return - Degrees Reset | –30 to 30ΔF (–16.6 to 16.6ΔC) | XX.XΔF | RTN_DEG | 0.0ΔF (0.0ΔC) |
| →***DMDC*** | Demand Limit Select | 0 = None<br>1 = Switch (Requires EMM)<br>2 = 4 to 20 mA Input (Requires EMM)<br>3 = CCN Loadshed | X | DMD_CTRL | 0 = None |
| →***DM20*** | Demand Limit at 20 mA | 0 to 100 | XXX% | DMT20MA | 100 |
| →***SHNM*** | Loadshed Group Number | 0 to 99 | XXX | SHED_NUM | 0 |
| →***SHDL*** | Loadshed Demand Delta | 0 to 60 | XXX% | SHED_DEL | 0 |
| →***SHTM*** | Maximum Loadshed Time | 0 to 120 | XXX | SHED_TIM | 60 |
| →***DLS1*** | Demand Limit Switch 1 | 0 to 100 | XXX% | DLSWSP1 | 80 |
| →***DLS2*** | Demand Limit Switch 2 | 0 to 100 | XXX% | DLSWSP2 | 50 |
| →***LLEN*** | Lead/Lag Chiller Enable | DSBL/ENBL | | LL_ENA | DSBL |
| →***MSSL*** | Master/Slave Select | SLVE/MAST | | MS_SEL | MAST |
| →***SLVA*** | Slave Address | 0 to 239 | XXX | SLV_ADDR | 0 |
| →***LLBL*** | Lead/Lag Balance Select | 0 = Master Leads<br>1 = Slave Leads<br>2 = Automatic | X | LL_BAL | 0 = Master Leads |
| →***LLBD*** | Lead/Lag Balance Delta | 40 to 400 hours | XXX | LL_BAL_D | 168 |
| →***LLDY*** | Lag Start Delay | 0 to 30 minutes | XXX | LL_DELAY | 5 minutes |
| →***PARA*** | Parallel Configuration | NO/YES | | PARALLEL | YES |
| ***SLCT*** | SETPOINT AND RAMP LOAD | | | | |
| →***CLSP*** | Cooling Set Point Select | 0 = Single<br>1 = Dual Switch<br>2 = Dual CCN Occupied<br>3 = 4 to 20 mA Input | X | CLSP_TYP | 0 = Single |
| →***RL.S*** | Ramp Load Select | DSBL/ENBL | | RAMP_EBL | ENBL |
| →***CRMP*** | Cooling Ramp Loading | 0.2 to 2 | X.X | CRAMP | 1.0 |
| →***SCHD*** | Schedule Number | 0 to 99 | XX | SCHEDNUM | 0 |
| →***Z.GN*** | Deadband Multiplier | 1 to 4 | X.X | Z_GAIN | 1.0 |
| ***SERV*** | SERVICE CONFIGURATION | | | | |
| →***EN.A1*** | Enable Compressor A1 | DSBL/ENBL | | ENABLEA1 | |
| →***EN.A2*** | Enable Compressor A2 | DSBL/ENBL | | ENABLEA2 | |
| →***EN.A3*** | Enable Compressor A3 | DSBL/ENBL | | ENABLEA3 | |
| →***REV.R*** | Reverse Rotation Enable | DSBL/ENBL | | REVR_ENA | ENBL |
| ***BCST*** | BROADCAST CONFIGURATION | | | | |
| →***T.D.BC*** | CCN Time/Date Broadcast | OFF/ON | | CCNBC | OFF |
| →***OAT.B*** | CCN OAT Broadcast | OFF/ON | | OATBC | OFF |
| →***G.S.BC*** | Global Schedule Broadcst | OFF/ON | | GSBC | OFF |
| →***BC.AK*** | CCN Broadcast Ack'er | OFF/ON | | CCNBCACK | OFF |

# APPENDIX A — LOCAL DISPLAY TABLES (cont)

## Time Clock Mode and Sub-Mode Directory

| ITEM | EXPANSION | RANGE | UNITS | CCN POINT | DEFAULT |
|---|---|---|---|---|---|
| ***TIME*** | TIME OF DAY | | | | |
| ***→HH.MM*** | Hour and Minute | 0 to 65535 | XXXXX | TIME | |
| ***DATE*** | MONTH, DATE, DAY, AND YEAR | | | | |
| ***→MNTH*** | Month of Year | 1 to 12 (1 = January, 2 = February, etc.) | XX | MOY | |
| ***→DOM*** | Day of Month | 1 to 31 | XX | DOM | |
| ***→DAY*** | Day of Week | 1 - 7 (1 = Monday, 2 = Tuesday, etc.) | X | DOWDISP | |
| ***→YEAR*** | Year of Century | 1999 to 2098 | XXXX | YOCDISP | |
| ***DST*** | DAYLIGHT SAVINGS TIME | | | | |
| ***→STR.M*** | Month | 1 to 12 | XX | STARTM | 4 |
| ***→STR.W*** | Week | 1 to 5 | X | STARTW | 1 |
| ***→STR.D*** | Day | 1 to 7 | X | STARTD | 7 |
| ***→MIN.A*** | Minutes to Add | 0 to 90 | XX | MINADD | 60 |
| ***→STP.M*** | Month | 1 to 12 | XX | STOPM | 10 |
| ***→STP.W*** | Week | 1 to 5 | XX | STOPW | 5 |
| ***→STP.D*** | Day | 1 to 7 | XX | STOPD | 7 |
| ***→MIN.S*** | Minutes to Subtract | 0 to 90 | XX | MINSUB | 60 |
| ***HOL.L*** | LOCAL HOLIDAY SCHEDULES | | | | |
| ***→HD.01*** | HOLIDAY SCHEDULE 01 | | | | |
| ***→HD.01→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON01 | |
| ***→HD.01→DAY*** | Start Day | 0 to 31 | XX | HOLDAY01 | |
| ***→HD.01→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN01 | |
| ***→HD.02*** | HOLIDAY SCHEDULE 02 | | | | |
| ***→HD.02→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON02 | |
| ***→HD.02→DAY*** | Start Day | 0 to 31 | XX | HOLDAY02 | |
| ***→HD.02→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN02 | |
| ***→HD.03*** | HOLIDAY SCHEDULE 03 | | | | |
| ***→HD.03→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON03 | |
| ***→HD.03→DAY*** | Start Day | 0 to 31 | XX | HOLDAY03 | |
| ***→HD.03→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN03 | |
| ***→HD.04*** | HOLIDAY SCHEDULE 04 | | | | |
| ***→HD.04→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON04 | |
| ***→HD.04→DAY*** | Start Day | 0 to 31 | XX | HOLDAY04 | |
| ***→HD.04→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN04 | |
| ***→HD.05*** | HOLIDAY SCHEDULE 05 | | | | |
| ***→HD.05→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON05 | |
| ***→HD.05→DAY*** | Start Day | 0 to 31 | XX | HOLDAY05 | |
| ***→HD.05→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN05 | |
| ***→HD.06*** | HOLIDAY SCHEDULE 06 | | | | |
| ***→HD.06→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON06 | |
| ***→HD.06→DAY*** | Start Day | 0 to 31 | XX | HOLDAY06 | |
| ***→HD.06→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN06 | |
| ***→HD.07*** | HOLIDAY SCHEDULE 07 | | | | |
| ***→HD.07→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON07 | |
| ***→HD.07→DAY*** | Start Day | 0 to 31 | XX | HOLDAY07 | |
| ***→HD.07→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN07 | |
| ***→HD.08*** | HOLIDAY SCHEDULE 08 | | | | |
| ***→HD.08→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON08 | |
| ***→HD.08→DAY*** | Start Day | 0 to 31 | XX | HOLDAY08 | |
| ***→HD.08→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN08 | |
| ***→HD.09*** | HOLIDAY SCHEDULE 09 | | | | |
| ***→HD.09→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON09 | |
| ***→HD.09→DAY*** | Start Day | 0 to 31 | XX | HOLDAY09 | |
| ***→HD.09→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN09 | |
| ***→HD.10*** | HOLIDAY SCHEDULE 10 | | | | |
| ***→HD.10→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON10 | |
| ***→HD.10→DAY*** | Start Day | 0 to 31 | XX | HOLDAY10 | |
| ***→HD.10→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN10 | |
| ***→HD.11*** | HOLIDAY SCHEDULE 11 | | | | |
| ***→HD.11→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON11 | |
| ***→HD.11→DAY*** | Start Day | 0 to 31 | XX | HOLDAY11 | |
| ***→HD.11→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN11 | |
| ***→HD.12*** | HOLIDAY SCHEDULE 12 | | | | |
| ***→HD.12→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON12 | |
| ***→HD.12→DAY*** | Start Day | 0 to 31 | XX | HOLDAY12 | |
| ***→HD.12→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN12 | |
| ***→HD.13*** | HOLIDAY SCHEDULE 13 | | | | |
| ***→HD.13→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON13 | |
| ***→HD.13→DAY*** | Start Day | 0 to 31 | XX | HOLDAY13 | |
| ***→HD.13→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN13 | |

# APPENDIX A — LOCAL DISPLAY TABLES (cont)

## Time Clock Mode and Sub-Mode Directory

| ITEM | EXPANSION | RANGE | UNITS | CCN POINT | DEFAULT |
|---|---|---|---|---|---|
| ***HOL.L*** | LOCAL HOLIDAY SCHEDULES | | | | |
| ***→HD.14*** | HOLIDAY SCHEDULE 14 | | | | |
| ***→HD.14→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON14 | |
| ***→HD.14→DAY*** | Start Day | 0 to 31 | XX | HOLDAY14 | |
| ***→HD.14→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN14 | |
| ***→HD.15*** | HOLIDAY SCHEDULE 15 | | | | |
| ***→HD.15→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON15 | |
| ***→HD.15→DAY*** | Start Day | 0 to 31 | XX | HOLDAY15 | |
| ***→HD.15→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN15 | |
| ***→HD.16*** | HOLIDAY SCHEDULE 16 | | | | |
| ***→HD.16→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON16 | |
| ***→HD.16→DAY*** | Start Day | 0 to 31 | XX | HOLDAY16 | |
| ***→HD.16→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN16 | |
| ***→HD.17*** | HOLIDAY SCHEDULE 17 | | | | |
| ***→HD.17→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON17 | |
| ***→HD.17→DAY*** | Start Day | 0 to 31 | XX | HOLDAY17 | |
| ***→HD.17→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN17 | |
| ***→HD.18*** | HOLIDAY SCHEDULE 18 | | | | |
| ***→HD.18→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON18 | |
| ***→HD.18→DAY*** | Start Day | 0 to 31 | XX | HOLDAY18 | |
| ***→HD.18→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN18 | |
| ***→HD.19*** | HOLIDAY SCHEDULE 19 | | | | |
| ***→HD.19→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON19 | |
| ***→HD.19→DAY*** | Start Day | 0 to 31 | XX | HOLDAY19 | |
| ***→HD.19→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN19 | |
| ***→HD.20*** | HOLIDAY SCHEDULE 20 | | | | |
| ***→HD.20→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON20 | |
| ***→HD.20→DAY*** | Start Day | 0 to 31 | XX | HOLDAY20 | |
| ***→HD.20→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN20 | |
| ***→HD.21*** | HOLIDAY SCHEDULE 21 | | | | |
| ***→HD.21→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON21 | |
| ***→HD.21→DAY*** | Start Day | 0 to 31 | XX | HOLDAY21 | |
| ***→HD.21→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN21 | |
| ***→HD.22*** | HOLIDAY SCHEDULE 22 | | | | |
| ***→HD.22→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON22 | |
| ***→HD.22→DAY*** | Start Day | 0 to 31 | XX | HOLDAY22 | |
| ***→HD.22→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN22 | |
| ***→HD.23*** | HOLIDAY SCHEDULE 23 | | | | |
| ***→HD.23→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON23 | |
| ***→HD.23→DAY*** | Start Day | 0 to 31 | XX | HOLDAY23 | |
| ***→HD.23→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN23 | |
| ***→HD.24*** | HOLIDAY SCHEDULE 24 | | | | |
| ***→HD.24→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON24 | |
| ***→HD.24→DAY*** | Start Day | 0 to 31 | XX | HOLDAY24 | |
| ***→HD.24→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN24 | |
| ***→HD.25*** | HOLIDAY SCHEDULE 25 | | | | |
| ***→HD.25→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON25 | |
| ***→HD.25→DAY*** | Start Day | 0 to 31 | XX | HOLDAY25 | |
| ***→HD.25→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN25 | |
| ***→HD.26*** | HOLIDAY SCHEDULE 26 | | | | |
| ***→HD.26→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON26 | |
| ***→HD.26→DAY*** | Start Day | 0 to 31 | XX | HOLDAY26 | |
| ***→HD.26→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN26 | |
| ***→HD.27*** | HOLIDAY SCHEDULE 27 | | | | |
| ***→HD.27→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON27 | |
| ***→HD.27→DAY*** | Start Day | 0 to 31 | XX | HOLDAY27 | |
| ***→HD.27→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN27 | |
| ***→HD.28*** | HOLIDAY SCHEDULE 28 | | | | |
| ***→HD.28→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON28 | |
| ***→HD.28→DAY*** | Start Day | 0 to 31 | XX | HOLDAY28 | |
| ***→HD.28→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN28 | |
| ***→HD.29*** | HOLIDAY SCHEDULE 29 | | | | |
| ***→HD.29→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON29 | |
| ***→HD.29→DAY*** | Start Day | 0 to 31 | XX | HOLDAY29 | |
| ***→HD.29→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN29 | |
| ***→HD.30*** | HOLIDAY SCHEDULE 30 | | | | |
| ***→HD.30→MON*** | Holiday Start Month | 0 to 12 | XX | HOLMON30 | |
| ***→HD.30→DAY*** | Start Day | 0 to 31 | XX | HOLDAY30 | |
| ***→HD.30→LEN*** | Duration (days) | 0 to 99 | XX | HOLLEN30 | |
| ***SCH.N*** | SCHEDULE NUMBER | 0 to 99 | XX | SCHEDNUM | 0 |

## APPENDIX A — LOCAL DISPLAY TABLES (cont)

### Time Clock Mode and Sub-Mode Directory (cont)

| ITEM | EXPANSION | RANGE | UNITS | CCN POINT | DEFAULT |
|---|---|---|---|---|---|
| ***SCH.L*** | LOCAL OCCUPANCY SCHEDULE | | | | |
| ***→PER.1*** | OCCUPANCY PERIOD 1 | | | | |
| ***→PER.1→OCC.1*** | Period Occupied Time | 0 to 6144 | XX:XX | PER1OCC | |
| ***→PER.1→UNC.1*** | Period Unoccupied Time | 0 to 6144 | XX:XX | PER1UNC | |
| ***→PER.1→MON.1*** | Monday In Period | NO/YES | | PER1MON | |
| ***→PER.1→TUE.1*** | Tuesday In Period | NO/YES | | PER1TUE | |
| ***→PER.1→WED.1*** | Wednesday In Period | NO/YES | | PER1WED | |
| ***→PER.1→THU.1*** | Thursday In Period | NO/YES | | PER1THU | |
| ***→PER.1→FRI.1*** | Friday In Period | NO/YES | | PER1FRI | |
| ***→PER.1→SAT.1*** | Saturday In Period | NO/YES | | PER1SAT | |
| ***→PER.1→SUN.1*** | Sunday In Period | NO/YES | | PER1SUN | |
| ***→PER.1→HOL.1*** | Holiday In Period | NO/YES | | PER1HOL | |
| ***→PER.2*** | OCCUPANCY PERIOD 2 | | | | |
| ***→PER.2→OCC.2*** | Period Occupied Time | 0 to 6144 | XX:XX | PER2OCC | |
| ***→PER.2→UNC.2*** | Period Unoccupied Time | 0 to 6144 | XX:XX | PER2UNC | |
| ***→PER.2→MON.2*** | Monday In Period | NO/YES | | PER2MON | |
| ***→PER.2→TUE.2*** | Tuesday In Period | NO/YES | | PER2TUE | |
| ***→PER.2→WED.2*** | Wednesday In Period | NO/YES | | PER2WED | |
| ***→PER.2→THU.2*** | Thursday In Period | NO/YES | | PER2THU | |
| ***→PER.2→FRI.2*** | Friday In Period | NO/YES | | PER2FRI | |
| ***→PER.2→SAT.2*** | Saturday In Period | NO/YES | | PER2SAT | |
| ***→PER.2→SUN.2*** | Sunday In Period | NO/YES | | PER2SUN | |
| ***→PER.2→HOL.2*** | Holiday In Period | NO/YES | | PER2HOL | |
| ***→PER.3*** | OCCUPANCY PERIOD 3 | | | | |
| ***→PER.3→OCC.3*** | Period Occupied Time | 0 to 6144 | XX:XX | PER3OCC | |
| ***→PER.3→UNC.3*** | Period Unoccupied Time | 0 to 6144 | XX:XX | PER3UNC | |
| ***→PER.3→MON.3*** | Monday In Period | NO/YES | | PER3MON | |
| ***→PER.3→TUE.3*** | Tuesday In Period | NO/YES | | PER3TUE | |
| ***→PER.3→WED.3*** | Wednesday In Period | NO/YES | | PER3WED | |
| ***→PER.3→THU.3*** | Thursday In Period | NO/YES | | PER3THU | |
| ***→PER.3→FRI.3*** | Friday In Period | NO/YES | | PER3FRI | |
| ***→PER.3→SAT.3*** | Saturday In Period | NO/YES | | PER3SAT | |
| ***→PER.3→SUN.3*** | Sunday In Period | NO/YES | | PER3SUN | |
| ***→PER.3→HOL.3*** | Holiday In Period | NO/YES | | PER3HOL | |
| ***→PER.4*** | OCCUPANCY PERIOD 4 | | | | |
| ***→PER.4→OCC.4*** | Period Occupied Time | 0 to 6144 | XX:XX | PER4OCC | |
| ***→PER.4→UNC.4*** | Period Unoccupied Time | 0 to 6144 | XX:XX | PER4UNC | |
| ***→PER.4→MON.4*** | Monday In Period | NO/YES | | PER4MON | |
| ***→PER.4→TUE.4*** | Tuesday In Period | NO/YES | | PER4TUE | |
| ***→PER.4→WED.4*** | Wednesday In Period | NO/YES | | PER4WED | |
| ***→PER.4→THU.4*** | Thursday In Period | NO/YES | | PER4THU | |
| ***→PER.4→FRI.4*** | Friday In Period | NO/YES | | PER4FRI | |
| ***→PER.4→SAT.4*** | Saturday In Period | NO/YES | | PER4SAT | |
| ***→PER.4→SUN.4*** | Sunday In Period | NO/YES | | PER4SUN | |
| ***→PER.4→HOL.4*** | Holiday In Period | NO/YES | | PER4HOL | |
| ***→PER.5*** | OCCUPANCY PERIOD 5 | | | | |
| ***→PER.5→OCC.5*** | Period Occupied Time | 0 to 6144 | XX:XX | PER5OCC | |
| ***→PER.5→UNC.5*** | Period Unoccupied Time | 0 to 6144 | XX:XX | PER5UNC | |
| ***→PER.5→MON.5*** | Monday In Period | NO/YES | | PER5MON | |
| ***→PER.5→TUE.5*** | Tuesday In Period | NO/YES | | PER5TUE | |
| ***→PER.5→WED.5*** | Wednesday In Period | NO/YES | | PER5WED | |
| ***→PER.5→THU.5*** | Thursday In Period | NO/YES | | PER5THU | |
| ***→PER.5→FRI.5*** | Friday In Period | NO/YES | | PER5FRI | |
| ***→PER.5→SAT.5*** | Saturday In Period | NO/YES | | PER5SAT | |
| ***→PER.5→SUN.5*** | Sunday In Period | NO/YES | | PER5SUN | |
| ***→PER.5→HOL.5*** | Holiday In Period | NO/YES | | PER5HOL | |
| ***→PER.6*** | OCCUPANCY PERIOD 6 | | | | |
| ***→PER.6→OCC.6*** | Period Occupied Time | 0 to 6144 | XX:XX | PER6OCC | |
| ***→PER.6→UNC.6*** | Period Unoccupied Time | 0 to 6144 | XX:XX | PER6UNC | |
| ***→PER.6→MON.6*** | Monday In Period | NO/YES | | PER6MON | |
| ***→PER.6→TUE.6*** | Tuesday In Period | NO/YES | | PER6TUE | |
| ***→PER.6→WED.6*** | Wednesday In Period | NO/YES | | PER6WED | |
| ***→PER.6→THU.6*** | Thursday In Period | NO/YES | | PER6THU | |
| ***→PER.6→FRI.6*** | Friday In Period | NO/YES | | PER6FRI | |
| ***→PER.6→SAT.6*** | Saturday In Period | NO/YES | | PER6SAT | |
| ***→PER.6→SUN.6*** | Sunday In Period | NO/YES | | PER6SUN | |
| ***→PER.6→HOL.6*** | Holiday In Period | NO/YES | | PER6HOL | |
| ***→PER.7*** | OCCUPANCY PERIOD 7 | | | | |
| ***→PER.7→OCC.7*** | Period Occupied Time | 0 to 6144 | XX:XX | PER7OCC | |
| ***→PER.7→UNC.7*** | Period Unoccupied Time | 0 to 6144 | XX:XX | PER7UNC | |
| ***→PER.7→MON.7*** | Monday In Period | NO/YES | | PER7MON | |
| ***→PER.7→TUE.7*** | Tuesday In Period | NO/YES | | PER7TUE | |
| ***→PER.7→WED.7*** | Wednesday In Period | NO/YES | | PER7WED | |
| ***→PER.7→THU.7*** | Thursday In Period | NO/YES | | PER7THU | |
| ***→PER.7→FRI.7*** | Friday In Period | NO/YES | | PER7FRI | |
| ***→PER.7→SAT.7*** | Saturday In Period | NO/YES | | PER7SAT | |
| ***→PER.7→SUN.7*** | Sunday In Period | NO/YES | | PER7SUN | |
| ***→PER.7→HOL.7*** | Holiday In Period | NO/YES | | PER7HOL | |

# APPENDIX A — LOCAL DISPLAY TABLES (cont)

## Time Clock Mode and Sub-Mode Directory (cont)

| ITEM | EXPANSION | RANGE | UNITS | CCN POINT | DEFAULT |
|---|---|---|---|---|---|
| ***SCH.L (cont)*** | LOCAL OCCUPANCY SCHEDULE | | | | |
| ***→PER.8*** | OCCUPANCY PERIOD 8 | | | | |
| ***→PER.8→OCC.8*** | Period Occupied Time | 0 to 6144 | XX:XX | PER8OCC | |
| ***→PER.8→UNC.8*** | Period Unoccupied Time | 0 to 6144 | XX:XX | PER8UNC | |
| ***→PER.8→MON.8*** | Monday In Period | NO/YES | | PER8MON | |
| ***→PER.8→TUE.8*** | Tuesday In Period | NO/YES | | PER8TUE | |
| ***→PER.8→WED.8*** | Wednesday In Period | NO/YES | | PER8WED | |
| ***→PER.8→THU.8*** | Thursday In Period | NO/YES | | PER8THU | |
| ***→PER.8→FRI.8*** | Friday In Period | NO/YES | | PER8FRI | |
| ***→PER.8→SAT.8*** | Saturday In Period | NO/YES | | PER8SAT | |
| ***→PER.8→SUN.8*** | Sunday In Period | NO/YES | | PER8SUN | |
| ***→PER.8→HOL.8*** | Holiday In Period | NO/YES | | PER8HOL | |
| ***→OVR*** | SCHEDULE OVERRIDE | | | | |
| ***→OVR→OVR.T*** | Timed Override Hours | 0 to 4 hours | X | OVR_EXT | 0 |
| ***→OVR→OVR.L*** | Override Time Limit | 0 to 4 hours | X | OTL | 0 |
| ***→OVR→T.OVR*** | Timed Override | NO/YES | | TIMEOVER | NO |

## Operating Mode and Sub-Mode Directory

| ITEM | EXPANSION | RANGE | UNITS | CCN POINT | DEFAULT |
|---|---|---|---|---|---|
| ***MODE*** | MODES CONTROLLING UNIT | | | | |
| ***→MD01*** | CSM controlling Chiller | OFF/ON | | MODE_1 | |
| ***→MD02*** | WSM controlling Chiller | OFF/ON | | MODE_2 | |
| ***→MD03*** | Master/Slave control | OFF/ON | | MODE_3 | |
| ***→MD05*** | Ramp Load Limited | OFF/ON | | MODE_5 | |
| ***→MD06*** | Timed Override in effect | OFF/ON | | MODE_6 | |
| ***→MD07*** | Low Cooler Suction TempA | OFF/ON | | MODE_7 | |
| ***→MD09*** | Slow Change Override | OFF/ON | | MODE_9 | |
| ***→MD10*** | Minimum OFF time active | OFF/ON | | MODE_10 | |
| ***→MD13*** | Dual Setpoint | OFF/ON | | MODE_13 | |
| ***→MD14*** | Temperature Reset | OFF/ON | | MODE_14 | |
| ***→MD15*** | Demand/Sound Limited | OFF/ON | | MODE_15 | |
| ***→MD16*** | Cooler Freeze Protection | OFF/ON | | MODE_16 | |
| ***→MD17*** | Low Temperature Cooling | OFF/ON | | MODE_17 | |
| ***→MD18*** | High Temperature Cooling | OFF/ON | | MODE_18 | |
| ***→MD19*** | Making ICE | OFF/ON | | MODE_19 | |
| ***→MD20*** | Storing ICE | OFF/ON | | MODE_20 | |
| ***→MD21*** | High SCT Circuit A | OFF/ON | | MODE_21 | |
| ***→MD23*** | Minimum Comp. On Time | OFF/ON | | MODE_23 | |
| ***→MD24*** | Pump Off Delay Time | OFF/ON | | MODE_24 | |
| ***→MD25*** | Low Sound Mode | OFF/ON | | MODE_25 | |

# APPENDIX A — LOCAL DISPLAY TABLES (cont)

## Alarms Mode and Sub-Mode Directory

| ITEM | EXPANSION | RANGE | UNITS | CCN POINT | COMMENT |
|---|---|---|---|---|---|
| ***CRNT*** | CURRENTLY ACTIVE ALARMS | | | | |
| ***→AA01*** | | | | | |
| ***→AA02*** | | | | | |
| ***→AA03*** | | | | | |
| ***→AA04*** | | | | | |
| ***→AA05*** | | | | | |
| ***→AA06*** | | | | | |
| ***→AA07*** | | | | | |
| ***→AA08*** | | | | | |
| ***→AA09*** | | | | | |
| ***→AA10*** | | | | | |
| ***→AA11*** | | | | | Alarms are shown as AXXX<br>Alerts are shown as TXXX<br>PreAlerts are shown as PXXX |
| ***→AA12*** | | AXXX<br>TXXX<br>PXXX | | | |
| ***→AA13*** | Current Alarms 1-25 | | | | |
| ***→AA14*** | | | | | |
| ***→AA15*** | | | | | |
| ***→AA16*** | | | | | |
| ***→AA17*** | | | | | |
| ***→AA18*** | | | | | |
| ***→AA19*** | | | | | |
| ***→AA20*** | | | | | |
| ***→AA21*** | | | | | |
| ***→AA22*** | | | | | |
| ***→AA23*** | | | | | |
| ***→AA24*** | | | | | |
| ***→AA25*** | | | | | |
| ***RCRN*** | Reset All Current Alarms | NO/YES | | ALRESET | |
| ***HIST*** | ALARM HISTORY | | | | |
| ***→AL01*** | | | | | |
| ***→AL02*** | | | | | |
| ***→AL03*** | | | | | |
| ***→AL04*** | | | | | |
| ***→AL05*** | | | | | |
| ***→AL06*** | | | | | |
| ***→AL07*** | | | | | |
| ***→AL08*** | | | | | Alarms are shown as AXXX<br>Alerts are shown as TXXX<br>PreAlerts are shown as PXXX |
| ***→AL09*** | | AXXX<br>TXXX<br>PXXX | | | |
| ***→AL10*** | Alarm History 1-20 | | | | |
| ***→AL11*** | | | | | |
| ***→AL12*** | | | | | |
| ***→AL13*** | | | | | |
| ***→AL14*** | | | | | |
| ***→AL15*** | | | | | |
| ***→AL16*** | | | | | |
| ***→AL17*** | | | | | |
| ***→AL18*** | | | | | |
| ***→AL19*** | | | | | |
| ***→AL20*** | | | | | |

# APPENDIX B — CCN TABLES

## CCN DISPLAY TABLES

| TABLE | DISPLAY NAME | RANGE | UNITS | POINT NAME | WRITE STATUS |
|---|---|---|---|---|---|
| ***A-UNIT*** | GENERAL UNIT PARAMETERS | | | | |
| | Control Mode | 10-char ASCII | | STAT | |
| | Occupied | No/Yes | | OCC | |
| | CCN Chiller | Stop/Start | | CHIL_S_S | forcible |
| | Alarm State | 6-char ASCII | | ALM | |
| | Active Demand Limit | NNN | % | DEM_LIM | forcible |
| | Override Modes in Effect | No/Yes | | MODE | |
| | Percent Total Capacity | NNN | % | CAP_T | |
| | Requested Stage | NN | | STAGE | |
| | Active Setpoint | NNN.n | degF | SP | |
| | Control Point | NNN.n | degF | CTRL_PNT | forcible |
| | Degrees of Reset | NN.n | deltaF | DEG_RST | |
| | Entering Fluid Temp | NNN.n | degF | EWT | |
| | Leaving Fluid Temp | NNN.n | degF | LWT | |
| | Emergency Stop | Enable/EMStop | | EMSTOP | forcible |
| | Minutes Left for Start | 5-char ASCII | | MIN_LEFT | |
| | PUMPS | | | | |
| | Cooler Pump Relay | Off/On | | COOLPUMP | |
| | Condenser Pump | Off/On | | CONDPUMP | |
| | Cooler Flow Switch | Off/On | | COOLFLOW | |
| ***CIRCA_AN*** | CIRCUIT A ANALOG PARAMETERS | | | | |
| | Percent Total Capacity | NNN | % | CAPA_T | |
| | Percent Available Cap. | NNN | % | CAPA_A | |
| | Discharge Pressure | NNN.n | PSIG | DP_A | |
| | Suction Pressure | NNN.n | PSIG | SP_A | |
| | Head Setpoint | NNN.n | degF | HSP | |
| | Saturated Condensing Tmp | NNN.n | degF | TMP_SCTA | |
| | Saturated Suction Temp | NNN.n | degF | TMP_SSTA | |
| | Compr Return Gas Temp | NNN.n | degF | TMP_RGTA | |
| | Discharge Gas Temp | NNN.n | degF | DISGAS | |
| | Suction Superheat Temp | NNN.n | deltaF | SH_A | |
| ***CIRCADIO*** | CIRCUIT A DISCRETE INPUTS/OUTPUTS | | | | |
| | CIRC. A DISCRETE OUTPUTS | | | | |
| | Compressor A1 Relay | Off/On | | K_A1_RLY | |
| | Compressor A1 Unload Time | NN | secs | ALUNLTME | |
| | Compressor A2 Relay | Off/On | | K_A2_RLY | |
| | Compressor A3 Relay | Off/On | | K_A3_RLY | |
| | Minimum Load Valve Relay | Off/On | | MLV_RLY | |
| | CIRC. A DISCRETE INPUTS | | | | |
| | Compressor A1 Feedback | Off/On | | K_A1_FBK | |
| | Compressor A2 Feedback | Off/On | | K_A2_FBK | |
| | Compressor A3 Feedback | Off/On | | K_A3_FBK | |
| ***OPTIONS*** | UNIT PARAMETERS | | | | |
| | UNIT ANALOG VALUES | | | | |
| | Cooler Entering Fluid | NNN.n | degF | COOL_EWT | |
| | Cooler Leaving Fluid | NNN.n | degF | COOL_LWT | |
| | Condenser Entering Fluid | NNN.n | degF | COND_EWT | |
| | Condenser Leaving Fluid | NNN.n | degF | COND_LWT | |
| | Lead/Lag Leaving Fluid | NNN.n | degF | DUAL_LWT | |
| | TEMPERATURE RESET | | | | |
| | 4-20 ma Reset Signal | NN.n | milliAmps | RST_MA | |
| | Outside Air Temperature | NNN.n | degF | OAT | forcible |
| | Space Temperature | NNN.n | degF | SPT | forcible |
| | DEMAND LIMIT | | | | |
| | 4-20 ma Demand Signal | NN.n | milliAmps | LMT_MA | |
| | Demand Limit Switch 1 | Off/On | | DMD_SW1 | |
| | Demand Limit Switch 2 | Off/On | | DMD_SW2 | |
| | CCN Loadshed Signal | N | | DL_STAT | |
| | MISCELLANEOUS | | | | |
| | Dual Setpoint Switch | Off/On | | DUAL_IN | |
| | Cooler LWT Setpoint | NNN.n | degF | LWT_SP | |
| | Ice Done | Off/On | | ICE_DONE | |

## CCN MAINTENANCE TABLES

| TABLE | DISPLAY NAME | RANGE | UNITS | POINT NAME | WRITE STATUS |
|---|---|---|---|---|---|
| ***STRTHOUR*** | | | | | |
| | Machine Operating Hours | NNNNNN | hours | HR_MACH | |
| | Machine Starts | NNNNNN | hours | CY_MACH | |
| | Compressor A1 Run Hours | NNNNNN.n | hours | HR_A1 | |
| | Compressor A2 Run Hours | NNNNNN.n | hours | HR_A2 | |
| | Compressor A3 Run Hours | NNNNNN.n | | HR_A3 | |
| | Compressor A1 Starts | NNNNNN | | CY_A1 | |
| | Compressor A2 Starts | NNNNNN | | CY_A2 | |
| | Compressor A3 Starts | NNNNNN | | CY_A3 | |
| | PUMP HOURS | | | | |
| | Cooler Pump Run Hours | NNNNNN.n | hours | HR_CPUMP | |
| | Condenser Pump Run Hours | NNNNNN.n | hours | HR_DPUMP | |
| ***CURRMODS*** | | | | | |
| | CSM controlling Chiller | Off/On | | MODE_1 | |
| | WSM controlling Chiller | Off/On | | MODE_2 | |
| | Master/Slave control | Off/On | | MODE_3 | |
| | Ramp Load Limited | Off/On | | MODE_5 | |
| | Timed Override in effect | Off/On | | MODE_6 | |
| | Low Cooler Suction TempA | Off/On | | MODE_7 | |
| | Slow Change Override | Off/On | | MODE_9 | |
| | Minimum OFF time active | Off/On | | MODE_10 | |
| | Dual Setpoint | Off/On | | MODE_13 | |
| | Temperature Reset | Off/On | | MODE_14 | |
| | Demand/Sound Limited | Off/On | | MODE_15 | |
| | Cooler Freeze Protection | Off/On | | MODE_16 | |
| | Low Temperature Cooling | Off/On | | MODE_17 | |
| | High Temperature Cooling | Off/On | | MODE_18 | |
| | Making ICE | Off/On | | MODE_19 | |
| | Storing ICE | Off/On | | MODE_20 | |
| | High SCT Circuit A | Off/On | | MODE_21 | |
| | Minimum Comp. On Time | Off/On | | MODE_23 | |
| | Pump Off Delay Time | Off/On | | MODE_24 | |
| | Low Sound Mode | Off/On | | MODE_25 | |
| ***ALARMS*** | | | | | |
| | Active Alarm #1 | 4-char ASCII | | ALARM01C | |
| | Active Alarm #2 | 4-char ASCII | | ALARM02C | |
| | Active Alarm #3 | 4-char ASCII | | ALARM03C | |
| | Active Alarm #4 | 4-char ASCII | | ALARM04C | |
| | Active Alarm #5 | 4-char ASCII | | ALARM05C | |
| | Active Alarm #6 | 4-char ASCII | | ALARM06C | |
| | Active Alarm #7 | 4-char ASCII | | ALARM07C | |
| | Active Alarm #8 | 4-char ASCII | | ALARM08C | |
| | Active Alarm #9 | 4-char ASCII | | ALARM09C | |
| | Active Alarm #10 | 4-char ASCII | | ALARM10C | |
| | Active Alarm #11 | 4-char ASCII | | ALARM11C | |
| | Active Alarm #12 | 4-char ASCII | | ALARM12C | |
| | Active Alarm #13 | 4-char ASCII | | ALARM13C | |
| | Active Alarm #14 | 4-char ASCII | | ALARM14C | |
| | Active Alarm #15 | 4-char ASCII | | ALARM15C | |
| | Active Alarm #16 | 4-char ASCII | | ALARM16C | |
| | Active Alarm #17 | 4-char ASCII | | ALARM17C | |
| | Active Alarm #18 | 4-char ASCII | | ALARM18C | |
| | Active Alarm #19 | 4-char ASCII | | ALARM19C | |
| | Active Alarm #20 | 4-char ASCII | | ALARM20C | |
| | Active Alarm #21 | 4-char ASCII | | ALARM21C | |
| | Active Alarm #22 | 4-char ASCII | | ALARM22C | |
| | Active Alarm #23 | 4-char ASCII | | ALARM23C | |
| | Active Alarm #24 | 4-char ASCII | | ALARM24C | |
| | Active Alarm #25 | 4-char ASCII | | ALARM25C | |

## CCN MAINTENANCE TABLES (cont)

| TABLE | DISPLAY NAME | RANGE | UNITS | POINT NAME |
|---|---|---|---|---|
| ***VERSIONS*** | | | | |
| | CESR131333- | 5-char ASCII | | AUX |
| | CESR131482- | 5-char ASCII | | MBB |
| | CESR131174- | 5-char ASCII | | EMM |
| | CESR131171- | 5-char ASCII | | MARQUEE |
| | CESR131227- | 5-char ASCII | | NAVIGATOR |
| ***LOADFACT*** | CAPACITY CONTROL | | | |
| | Load/Unload Factor | NNN | | SMZ |
| | Control Point | NNN.n | degF | CTRL_PNT |
| | Entering Fluid Temp | NNN.n | degF | EWT |
| | Leaving Fluid Temp | NNN.n | degF | LWT |
| | Ramp Load Limited | Off/On | | MODE_5 |
| | Slow Change Override | Off/On | | MODE_9 |
| | Cooler Freeze Protection | Off/On | | MODE_16 |
| | Low Temperature Cooling | Off/On | | MODE_17 |
| | High Temperature Cooling | Off/On | | MODE_18 |
| | Minimum Comp. On Time | Off/On | | MODE_23 |
| ***LEARNFNS*** | | | | |
| | SCT Delta for Comp A1 | NNN.n | deltaF | A1SCTDT |
| | SCT Delta for Comp A2 | NNN.n | deltaF | A2SCTDT |
| | SCT Delta for Comp A3 | NNN.n | deltaF | A3SCTDT |
| ***PM-STRN*** | | | | |
| | Strainer Srvc Interval | NNNNN | hours | SI_STRNR |
| | Strainer Srvc Countdown | NNNNN | hours | ST_CDOWN |
| | Strainer Maint. Done | No/Yes | | ST_MAINT |
| | Strainer Maint. Date | 15-char ASCII | | STRN_PM0 |
| | Strainer Maint. Date | 15-char ASCII | | STRN_PM1 |
| | Strainer Maint. Date | 15-char ASCII | | STRN_PM2 |
| | Strainer Maint. Date | 15-char ASCII | | STRN_PM3 |
| | Strainer Maint. Date | 15-char ASCII | | STRN_PM4 |
| ***TESTMODE*** | | | | |
| | Service Test Mode | Off/On | | NET_CTRL |
| | Compressor A1 Relay | Off/On | | S_A1_RLY |
| | Compressor A2 Relay | Off/On | | S_A2_RLY |
| | Compressor A3 Relay | Off/On | | S_A3_RLY |
| | Cooler Pump Relay | Off/On | | S_CLPMP |
| | Condenser Pump | Off/On | | S_CNDPMP |
| | Comp A1 Unload Time | NN | secs | S_A1ULTM |
| | Remote Alarm Relay | Off/On | | S_ALM |
| ***RUNTEST*** | | | | |
| | Percent Total Capacity | NNN | % | CAPA_T |
| | Percent Available Cap. | NNN | % | CAPA_A |
| | Discharge Pressure | NNN.n | PSIG | DP_A |
| | Suction Pressure | NNN.n | PSIG | SP_A |
| | Saturated Condensing Tmp | NNN.n | degF | TMP_SCTA |
| | Saturated Suction Temp | NNN.n | degF | TMP_SSTA |
| | Compr Return Gas Temp | NNN.n | degF | TMP_RGTA |
| | Discharge Gas Temp | NNN.n | degF | DISGAS |
| | Suction Superheat Temp | NNN.n | deltaF | SH_A |
| | Compressor A1 Relay | Off/On | | K_A1_RLY |
| | Compressor A2 Relay | Off/On | | K_A2_RLY |
| | Compressor A3 Relay | Off/On | | K_A3_RLY |
| | Minimum Load Valve Relay | Off/On | | MLV_RLY |
| | Compressor A1 Feedback | Off/On | | K_A1_FBK |
| | Compressor A2 Feedback | Off/On | | K_A2_FBK |
| | Compressor A3 Feedback | Off/On | | K_A3_FBK |
| | Outside Air Temperature | NNN.n | degF | OAT |
| | Space Temperature | NNN.n | degF | SPT |
| | Cooler Pump Relay | Off/On | | COOLPUMP |
| | Condenser Pump | Off/On | | CONDPUMP |
| | Cooler Entering Fluid | NNN.n | degF | COOL_EWT |
| | Cooler Leaving Fluid | NNN.n | degF | COOL_LWT |
| | Condenser Entering Fluid | NNN.n | degF | COND_EWT |
| | Condenser Leaving Fluid | NNN.n | degF | COND_LWT |
| | Cooler Flow Switch | Off/On | | COOLFLOW |

# APPENDIX B — CCN TABLES (cont)

## CCN MAINTENANCE TABLES (cont)

| TABLE | DISPLAY NAME | RANGE | UNITS | POINT NAME |
|---|---|---|---|---|
| ***DUALCHIL*** | | | | |
| | Dual Chiller Link Good? | No/Yes | | DC_LINK |
| | Master Chiller Role | 12-char ASCII | | MC_ROLE |
| | Slave Chiller Role | 12-char ASCII | | SC_ROLE |
| | Lead Chiller Ctrl Point | NNN.n | degF | LEAD_CP |
| | Lag Chiller Ctrl Point | NNN.n | degF | LAG_CP |
| | Control Point | NNN.n | degF | CTRL_PNT |
| | Cool EnteringFluid-Slave | NNN.n | degF | COOLEWTS |
| | Cool Leaving Fluid-Slave | NNN.n | degF | COOLLWTS |
| | Cooler Entering Fluid | NNN.n | degF | COOL_EWT |
| | Cooler Leaving Fluid | NNN.n | degF | COOL_LWT |
| | Lead/Lag Leaving Fluid | NNN.n | degF | DUAL_LWT |
| | Percent Avail.Capacity | NNN | % | CAP_A |
| | Percent Avail.Cap.Slave | NNN | % | CAP_A_S |
| | Lag Start Delay Time | 5-char ASCII | | LAGDELAY |
| | Load/Unload Factor | NNN | | SMZ |
| | Load/Unload Factor-Slave | NNNN | | SMZSLAVE |
| | Lead SMZ Clear Commanded | No/Yes | | LEADSMZC |
| | Lag SMZ Clear Commanded | No/Yes | | LAG_SMZC |
| | Lag Commanded Off? | No/Yes | | LAG_OFF |
| | Dual Chill Lead CapLimit | NNN.n | % | DCLDCAPL |
| | Dual Chill Lag CapLimit | NNN.n | % | DCLGCAPL |

## CCN CONFIGURATION TABLES

| TABLE | DISPLAY NAME | RANGE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|---|
| ***UNIT*** | UNIT CONFIGURATION | | | | |
| | Unit Type | N | Unit Dependent | | UNIT_TYP |
| | Unit Size | NNN | Unit Size | tons | SIZE |
| | Compressor A1 Size | NNN | Unit Size Dependent | tons | SIZE_A1 |
| | Compressor A2 Size | NNN | Unit Size Dependent | tons | SIZE_A2 |
| | Compressor A3 Size | NNN | Unit Size Dependent | tons | SIZE_A3 |
| | Suction Superheat Setpt | NN.n | 9.0 deg F | deltaF | SH_SP |
| | Compressor A1 Digital? | No/Yes | Unit Dependent | | CPA1TYPE |
| | Maximum A1 Unload Time | NN | 10 - 015 to 030<br>7 - 035 to 045 | secs | MAXULTME |
| ***OPTIONS1*** | OPTIONS 1 CONFIGURATION | | | | |
| | Cooler Fluid | N | 1=Water | 1=Water<br>2=Medium Temperature Brine | FLUIDTYP |
| | Minimum Load Vlv Select | No/Yes | No | | MLV_FLG |
| | Return Gas Sensor Enable | Disable/Enable | Disable | | RGT_ENA |
| | Enable OAT Sensor | Disable/Enable | Disable | | OAT_ENA |
| | CSB Boards Enable | Disable/Enable | Enable | | CSB_ENA |
| | Reverse Rotation Enable | Disable/Enable | Enable | | REVR_ENA |
| | Cooler Pump Control | Off/On | Off | | CPC |
| | Cooler Pump Shutdown Dly | NN | 1 | mins | PUMP_DLY |
| | EMM Module Installed | No/Yes | No | | EMM_BRD |
| | Enable Condenser Pump | N | 0=No Conrol | 0=No Control<br>1=On When Occupied<br>2=On with Compressors | CONDPMPE |
| | Enable Cond Wtr Sensors | Disable/Enable | Disable | | CONDWTRS |
| | Enable Cond Flow Switch | Disable/Enable | Disable | | CONDFLSW |
| ***OPTIONS2*** | OPTIONS 2 CONFIGURATION | | | | |
| | Control Method | N | 0 | | CONTROL |
| | Loading Sequence Select | N | 1 | | SEQ_TYPE |
| | Lead/Lag Circuit Select | N | 1 | | LEAD_TYP |
| | Cooling Setpoint Select | N | 0 | | CLSP_TYP |
| | Ramp Load Select | Disable/Enable | Enable | | RAMP_EBL |
| | High LCW Alert Limit | NN.n | 60.0 | deltaF | LCW_LMT |
| | Minutes Off time | NN | 0 | mins | DELAY |
| | Deadband Multiplier | N.n | 1.0 | | Z_GAIN |
| | Ice Mode Enable | Disable/Enable | Disable | | ICE_CNFG |
| ***SCHEDOVR*** | TIME OVERRIDE SETUP | | | | |
| | Schedule Number | NN | 1 | | SCHEDNUM |
| | Override Time Limit | N | 0 | hours | OTL |
| | Timed Override Hours | N | 0 | hours | OVR_EXT |
| | Timed Override | No/Yes | No | | TIMEOVER |

## CCN CONFIGURATION TABLES (cont)

| TABLE | DISPLAY NAME | RANGE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|---|
| ***RESETCON*** | TEMPERATURE RESET AND DEMAND LIMIT | | | | |
| | COOLING RESET | | | | |
| | Cooling Reset Type | N | 0 | | CRST_TYP |
| | 4-20 MA RESET | | | | |
| | 4-20 - Degrees Reset | NNN.n | 10.0 | deltaF | MA_DEG |
| | REMOTE RESET | | | | |
| | Remote - No Reset Temp | NNN.n | 10.0 | degF | REM_NO |
| | Remote - Full Reset Temp | NNN.n | 0.0 | degF | REM_FULL |
| | Remote - Degrees Reset | NNN.n | 0.0 | deltaF | REM_DEG |
| | RETURN TEMPERATURE RESET | | | | |
| | Return - No Reset Temp | NNN.n | 10.0 | deltaF | RTN_NO |
| | Return - Full Reset Temp | NNN.n | 0.0 | deltaF | RTN_FULL |
| | Return - Degrees Reset | NNN.n | 0.0 | deltaF | RTN_DEG |
| | DEMAND LIMIT | | | | |
| | Demand Limit Select | N | 0 | | DMD_CTRL |
| | Demand Limit at 20 mA | NNN.n | 100.0 | % | DMT20MA |
| | Loadshed Group Number | NN | 0 | | SHED_NUM |
| | Loadshed Demand Delta | NN | 0 | % | SHED_DEL |
| | Maximum Loadshed Time | NNN | 60 | mins | SHED_TIM |
| | Demand Limit Switch 1 | NNN | 80 | % | DLSWSP1 |
| | Demand Limit Switch 2 | NNN | 50 | % | DLSWSP2 |
| ***DUALCHILL*** | DUAL CHILLER CONFIGURATION SETTINGS | | | | |
| | LEAD/LAG | | | | |
| | Lead/Lag Chiller Enable | Disable/Enable | Disable | | LL_ENA |
| | Master/Slave Select | Master/Slave | Master | | MS_SEL |
| | Slave Address | NNN | 2 | | SLV_ADDR |
| | Lead/Lag Balance Select | N | 0 | | LL_BAL |
| | Lead/Lag Balance Delta | NNN | 168 | hours | LL_BAL_D |
| | Lag Start Delay | NN | 5 | mins | LL_DELAY |
| | Parallel Configuration | No/Yes | Yes | | PARALLEL |
| ***DISPLAY*** | MARQUEE DISPLAY SETUP | | | | |
| | Service Password | NNNN | 1111 | | PASSWORD |
| | Password Enable | Disable/Enable | Enable | | PASS_EBL |
| | Metric Display | Off/On | Off | | DISPUNIT |
| | Language Selection | N | 0 | | LANGUAGE |

## CCN SERVICE TABLES

| TABLE | DISPLAY NAME | RANGE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|---|
| ***SERVICE*** | SERVICE | | | | |
| | Brine Freeze Point | NNN.n | 34.0 | degF | BRN_FRZ |
| | COMPRESSOR ENABLE | | | | |
| | Enable Compressor A1 | Disable/Enable | Unit Dependent | | ENABLEA1 |
| | Enable Compressor A2 | Disable/Enable | Unit Dependent | | ENABLEA2 |
| | Enable Compressor A3 | Disable/Enable | Unit Dependent | | ENABLEA3 |

## CCN SETPOINT TABLES

| TABLE | DISPLAY NAME | RANGE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|---|
| ***SETPOINT*** | SETPOINT | | | | |
| | COOLING | | | | |
| | Cooling Setpoint 1 | NNN.n | 44.0 | degF | CSP1 |
| | Cooling Setpoint 2 | NNN.n | 44.0 | degF | CSP2 |
| | ICE Setpoint | NNN.n | 32.0 | degF | CSP3 |
| | RAMP LOADING | | | | |
| | Cooling Ramp Loading | N.n | 1.0 | | CRAMP |
| | Brine Freeze Point | NNN.n | 34.0 | degF | BRN_FRZ |

## APPENDIX C — BACNET COMMUNICATION OPTION

The following section is used to configure the UPC Open controller which is used when the BACnet* communication option is selected. The UPC Open controller is mounted in the main control box per unit components arrangement diagrams.

TO ADDRESS THE UPC OPEN CONTROLLER — The user must give the UPC Open controller an address that is unique on the BACnet network. Perform the following procedure to assign an address:

1. If the UPC Open controller is powered, pull the screw terminal connector from the controller's power terminals labeled Gnd and HOT. The controller reads the address each time power is applied to it.
2. Using the rotary switches (see Fig. A and B), set the controller's address. Set the Tens (10's) switch to the tens digit of the address, and set the Ones (1's) switch to the ones digit.

As an example in Fig. B, if the controller's address is 25, point the arrow on the Tens (10's) switch to 2 and the arrow on the Ones (1's) switch to 5.

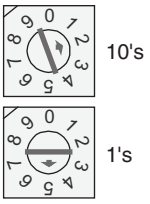



**Fig. B — Address Rotary Switches**

BACNET DEVICE INSTANCE ADDRESS — The UPC Open controller also has a BACnet Device Instance address. This Device Instance MUST be unique for the complete BACnet system in which the UPC Open controller is installed. The Device Instance is auto generated by default and is derived by adding the MAC address to the end of the Network Number. The Network Number of a new UPC Open controller is 16101, but it can be changed using i-Vu® Tools or BACView device. By default, a MAC address of 20 will result in a Device Instance of 16101 + 20 which would be a Device Instance of 1610120.

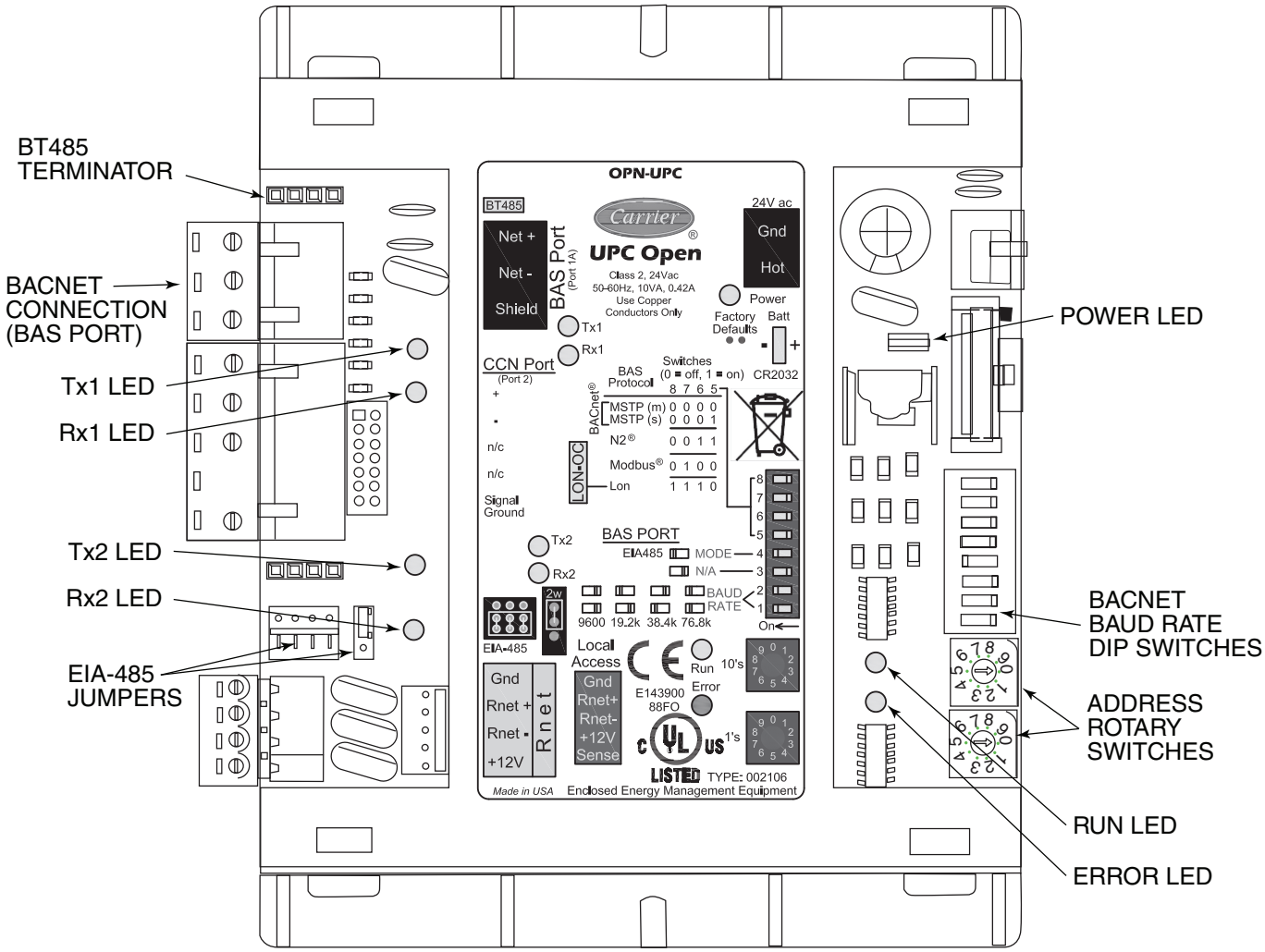



**Fig. A — UPC Open Controller**

* Sponsored by ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).

CONFIGURING THE BAS PORT FOR BACNET MS/TP — Use the same baud rate and communication settings for all controllers on the network segment. The UPC Open controller is fixed at 8 data bits, No Parity, and 1 Stop bit for this protocol's communications.

If the UPC Open controller has been wired for power, pull the screw terminal connector from the controller's power terminals labeled Gnd and HOT. The controller reads the DIP Switches and jumpers each time power is applied to it.

Set the BAS Port DIP switch DS3 to "enable." Set the BAS Port DIP switch DS4 to "E1-485." Set the BMS Protocol DIP switches DS8 through DS5 to "MSTP." See Table A.

**Table A — SW3 Protocol Switch Settings for MS/TP**

| DS8 | DS7 | DS6 | DS5 | DS4 | DS3 |
|---|---|---|---|---|---|
| Off | Off | Off | Off | On | Off |

Verify that the EIA-485 jumpers below the CCN Port are set to EIA-485 and 2W.

The example in Fig. C shows the BAS Port DIP Switches set for 76.8k (Carrier default) and MS/TP.

Set the BAS Port DIP Switches DS2 and DS1 for the appropriate communications speed of the MS/TP network (9600, 19.2k, 38.4k, or 76.8k bps). See Fig. C and Table B.

**Table B — Baud Selection Table**

| BAUD RATE | DS2 | DS1 |
|---|---|---|
| **9,600** | Off | Off |
| **19,200** | On | Off |
| **38,400** | Off | On |
| **76,800** | On | On |

WIRING THE UPC OPEN CONTROLLER TO THE MS/TP NETWORK — The UPC Open controller communicates using BACnet on an MS/TP network segment communications at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps.

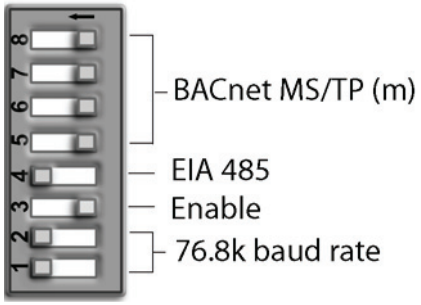



**Fig. C — DIP Switches**

Wire the controllers on an MS/TP network segment in a daisy-chain configuration. Wire specifications for the cable are 22 AWG (American Wire Gage) or 24 AWG, low-capacitance, twisted, stranded, shielded copper wire. The maximum length is 2000 ft.

Install a BT485 terminator on the first and last controller on a network segment to add bias and prevent signal distortions due to echoing. See Fig. A, D, and E.

To wire the UPC Open controller to the BAS network:

1. Pull the screw terminal connector from the controller's BAS Port.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the BAS port's screw terminals labeled Net +, Net -, and Shield.

NOTE: Use the same polarity throughout the network segment.

4. Insert the power screw terminal connector into the UPC Open controller's power terminals if they are not currently connected.
5. Verify communication with the network by viewing a module status report. To perform a module status report using the BACview keypad/display unit, press and hold the "FN" key then press the "." Key.

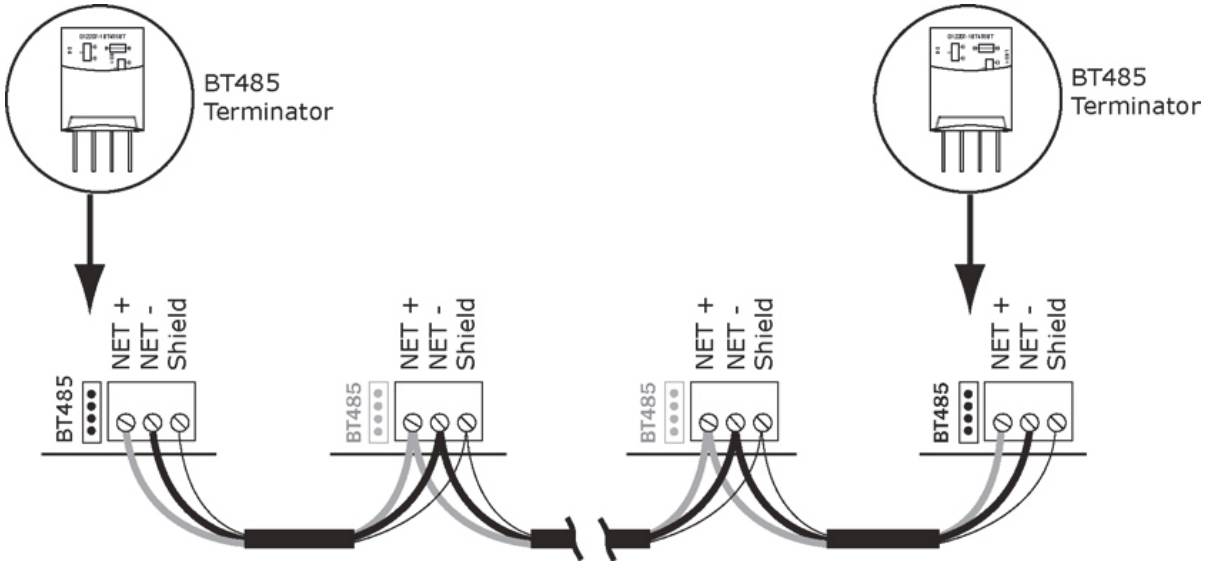



**Fig. D — Network Wiring**

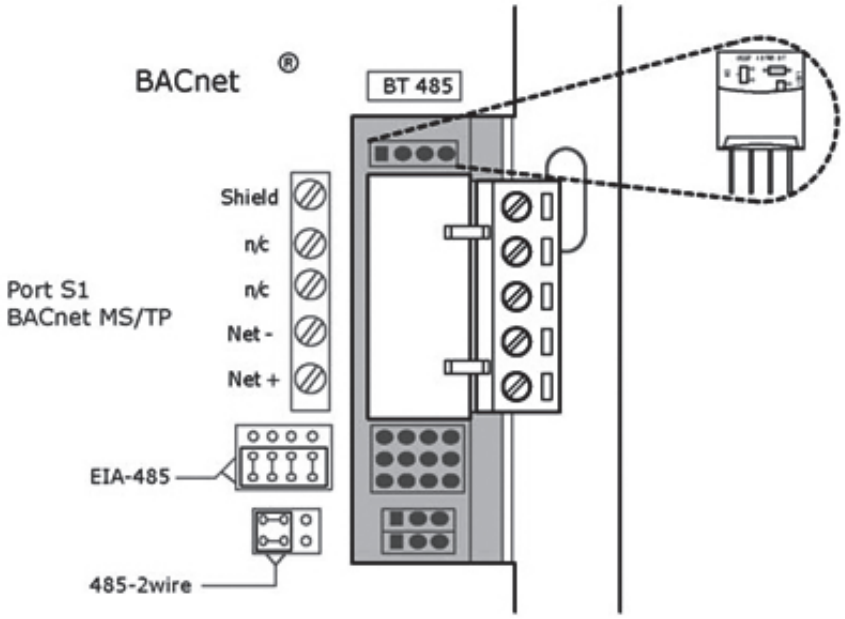



**Fig. E — BT485 Terminator Installation**

To install a BT485 terminator, push the BT485 terminator on to the BT485 connector located near the BACnet connector.

NOTE: The BT485 terminator has no polarity associated with it.

To order a BT485 terminator, consult Commercial Products i-Vu® Open Control System Master Prices.

MS/TP WIRING RECOMMENDATIONS — Recommendations are shown in Tables C and D. The wire jacket and UL temperature rating specifications list two acceptable alternatives. The Halar specification has a higher temperature rating and a tougher outer jacket than the SmokeGard specification, and it is appropriate for use in applications where the user is concerned about abrasion. The Halar jacket is also less likely to crack in extremely low temperatures.

NOTE: Use the specified type of wire and cable for maximum signal integrity.

**Table C — MS/TP Wiring Recommendations**

| SPECIFICATION | RECOMMMENDATION |
|---|---|
| **Cable** | Single twisted pair, low capacitance, CL2P, 22 AWG (7x30), TC foam FEP, plenum rated cable |
| **Conductor** | 22 or 24 AWG stranded copper (tin plated) |
| **Insulation** | Foamed FEP 0.015 in. (0.381 mm) wall 0.060 in. (1.524 mm) O.D. |
| **Color Code** | Black/White |
| **Twist Lay** | 2 in. (50.8 mm) lay on pair 6 twists/foot (20 twists/meter) nominal |
| **Shielding** | Aluminum/Mylar shield with 24 AWG TC drain wire |
| **Jacket** | SmokeGard Jacket (SmokeGard PVC) 0.021 in. (0.5334 mm) wall 0.175 in. (4.445 mm) O.D.<br>Halar Jacket (E-CTFE) 0.010 in. (0.254 mm) wall 0.144 in. (3.6576 mm) O.D. |
| **DC Resistance** | 15.2 Ohms/1000 feet (50 Ohms/km) nominal |
| **Capacitance** | 12.5 pF/ft (41 pF/meter) nominal conductor to conductor |
| **Characteristic Impedance** | 100 Ohms nominal |
| **Weight** | 12 lb/1000 feet (17.9 kg/km) |
| **UL Temperature Rating** | SmokeGard 167°F (75°C)<br>Halar -40 to 302°F (-40 to 150°C) |
| **Voltage** | 300 Vac, power limited |
| **Listing** | UL: NEC CL2P, or better |

LEGEND

**AWG** — American Wire Gage
**CL2P** — Class 2 Plenum Cable
**DC** — Direct Current
**FEP** — Fluorinated Ethylene Polymer
**NEC** — National Electrical Code
**O.D.** — Outside Diameter
**TC** — Tinned Copper
**UL** — Underwriters Laboratories

## APPENDIX C — BACNET COMMUNICATION OPTION (cont)

### Table D — Open System Wiring Specifications and Recommended Vendors

| WIRING SPECIFICATIONS | | RECOMMENDED VENDORS AND PART NUMBERS | | | |
|---|---|---|---|---|---|
| **Wire Type** | **Description** | **Connect Air International** | **Belden** | **RMCORP** | **Contractors Wire and Cable** |
| **MS/TP Network (RS-485)** | 22 AWG, single twisted shielded pair, low capacitance, CL2P, TC foam FEP, plenum rated. See MS/TP Installation Guide for specifications. | W221P-22227 | — | 25160PV | CLP0520LC |
| | 24 AWG, single twisted shielded pair, low capacitance, CL2P, TC foam FEP, plenum rated. See MS/TP Installation Guide for specifications. | W241P-2000F | 82841 | 25120-OR | — |
| **Rnet** | 4 conductor, unshielded, CMP, 18 AWG, plenum rated. | W184C-2099BLB | 6302UE | 21450 | CLP0442 |

LEGEND

**AWG** — American Wire Gage
**CL2P** — Class 2 Plenum Cable
**CMP** — Communications Plenum Rated
**FEP** — Fluorinated Ethylene Polymer
**TC** — Tinned Copper

LOCAL ACCESS TO THE UPC OPEN CONTROLLER — The user can use a BACview[6] handheld keypad display unit or the Virtual BACview software as a local user interface to an Open controller. These items let the user access the controller network information. These are accessory items and do not come with the UPC Open controller.

The BACview[6] unit connects to the local access port on the UPC Open controller. See Fig. F. The BACview software must be running on a laptop computer that is connected to the local access port on the UPC Open controller. The laptop will require an additional USB link cable for connection.

See the *BACview Installation and User Guide* for instructions on connecting and using the BACview[6] device.

To order a BACview[6] Handheld (BV6H), consult Commercial Products i-Vu Open Control System Master Prices.

CONFIGURING THE UPC OPEN CONTROLLER'S PROPERTIES — The UPC Open device and *Comfort*Link controller must be set to the same CCN Address (Element) number and CCN Bus number. The factory default settings for CCN Element and CCN Bus number are 1 and 0 respectively.

If modifications to the default Element and Bus number are required, both the *Comfort*Link and UPC Open configurations must be changed.

The following configurations are used to set the CCN Address and Bus number in the *Comfort*Link controller. These configurations can be changed using the scrolling marquee display or accessory Navigator handheld device.

***Configuration→CCN→CCN.A*** (CCN Address)

***Configuration→CCN→CCN.B*** (CCN Bus Number)

The following configurations are used to set the CCN Address and Bus Number in the UPC Open controller. These configurations can be changed using the accessory BACview[6] display.

Navigation: BACview→CCN
Home: Element Comm Stat
Element: 1
Bus: 0

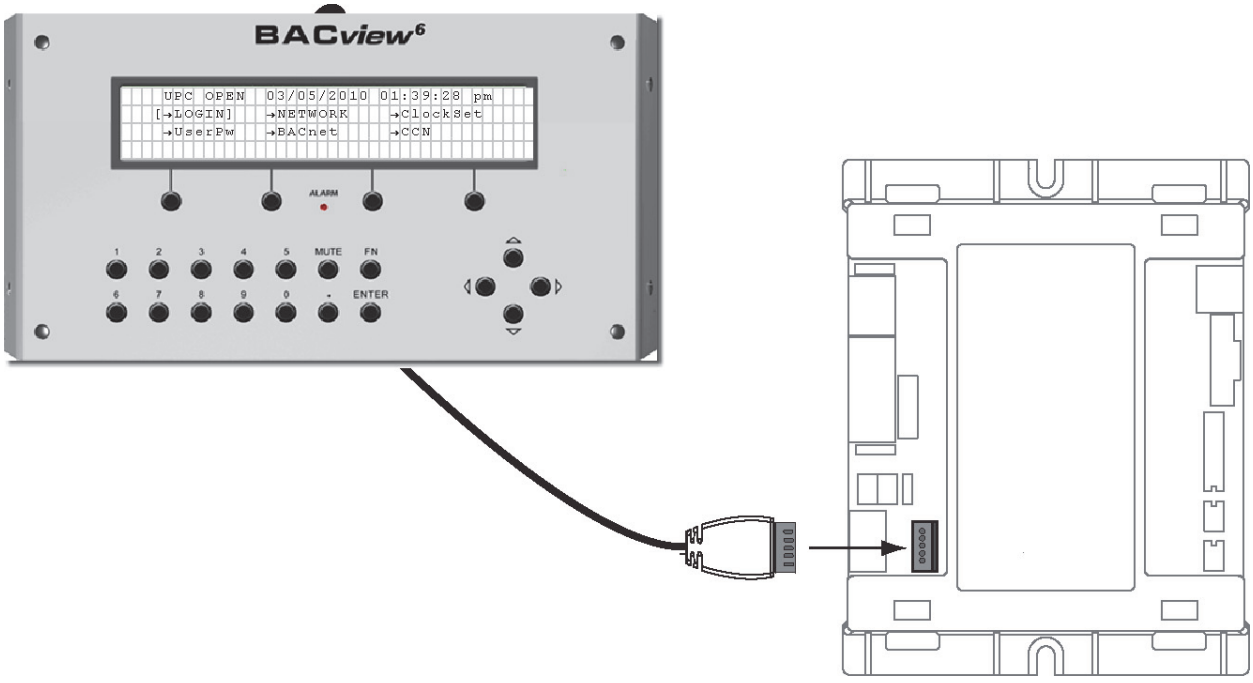



**Fig. F — BACview[6] Device Connection**

If the UPC Open is used with the chiller application of Lead/Lag/Standby, all chillers and UPC Open's CCN element numbers must be changed to a unique number in order to follow CCN specifications. In this application, there can only be a maximum of 3 UPC Open controllers on a CCN bus.

For the CCN Alarm Acknowledger configuration, the UPC Open defaults to CCN Acknowledger. If a Chiller Lead/Lag/Standby application is being used, then the Carrier technician must change the configuration to only one CCN Acknowledger on the CCN bus.

For the CCN Time Broadcaster configuration, the UPC Open defaults to CCN Time Broadcaster. If the Chiller Lead/Lag/Standby application is used, then the Carrier technician must change the configuration to only one CCN Time Broadcaster on the CCN bus.

TROUBLESHOOTING — If there are problems wiring or addressing the UPC Open controller, contact Carrier Technical Support.

COMMUNICATION LEDS — The LEDs indicate if the controller is communicating with the devices on the network. See Tables E and F. The LEDs should reflect communication traffic based on the baud rate set. The higher the baud rate the more solid the LEDs become. See Fig. A for location of LEDs on UPC Open module.

REPLACING THE UPC OPEN BATTERY — The UPC Open controller's 10-year lithium CR2032 battery provides a minimum of 10,000 hours of data retention during power outages.

IMPORTANT: Power must be **ON** to the UPC Open when replacing the battery, or the date, time, and trend data will be lost.

Remove the battery from the controller, making note of the battery's polarity. Insert the new battery, matching the battery's polarity with the polarity indicated on the UPC Open controller.

NETWORK POINTS LIST — The points list for the controller is shown in Table G.

Refer to Appendix B for additional information on CCN point name.

**Table E — LED Status Indicators**

| LED | STATUS |
|---|---|
| **Power** | Lights when power is being supplied to the controller. The UPC Open controller is protected by internal solid-state polyswitches on the incoming power and network connections. These polyswitches are not replaceable and will reset themselves if the condition that caused the fault returns to normal. |
| **Rx** | Lights when the controller receives data from the network segment; there is an Rx LED for Ports 1 and 2. |
| **Tx** | Lights when the controller transmits data to the network segment; there is a Tx LED for Ports 1 and 2. |
| **Run** | Lights based on controller status. See Table F. |
| **Error** | Lights based on controller status. See Table F. |

**Table F — Run and Error LEDs Controller and Network Status Indication**

| RUN LED | ERROR LED | STATUS |
|---|---|---|
| 2 flashes per second | Off | Normal |
| 2 flashes per second | 2 flashes, alternating with **Run** LED | Five minute auto-restart delay after system error |
| 2 flashes per second | 3 flashes, then off | Controller has just been formatted |
| 2 flashes per second | 1 flash per second | Controller is alone on the network |
| 2 flashes per second | On | Exec halted after frequent system errors or control programs halted |
| 5 flashes per second | On | Exec start-up aborted, Boot is running |
| 5 flashes per second | Off | Firmware transfer in progress, Boot is running |
| 7 flashes per second | 7 flashes per second, alternating with **Run** LED | Ten second recovery period after brownout |
| 14 flashes per second | 14 flashes per second, alternating with **Run** LED | Brownout |

# APPENDIX C — BACNET COMMUNICATION OPTION (cont)

## Table G — Network Points List

| POINT DESCRIPTION | CCN POINT NAME | READ/ WRITE | UNITS | DEFAULT VALUE | RANGE | BACNET OBJECT ID | BACNET OBJECT NAME |
|---|---|---|---|---|---|---|---|
| **4-20 ma Demand Signal** | LMT_MA | R | mA | | 0-20 | AV:36 | lmt_ma_1 |
| **4-20 ma Reset Signal** | RST_MA | R | mA | | 0-20 | AV:33 | rst_ma_1 |
| **Active Demand Limit** | DEM_LIM | R/W | % | 100 | 0-100 | AV:2 | dem_lim_1 |
| **Active Setpoint** | SP | R | °F | | -20-70 | AV:4 | sp_1 |
| **Alarm State** | ALM | R | | | 1 = Normal<br>2 = Alarm<br>3 = Alert | BV:59 | alm_1 |
| **CCN Chiller** | CHIL_S_S | R/W | | Start | Start/Stop | BV:4 | chil_s_s_1 |
| **CCN Loadshed Signal** | DL_STAT | R | | | 0-2 | AV:37 | dl_stat_1 |
| **Comp A1 Unload Time** | A1UNLTME | R | sec | | 1-15 | AV:78 | a1unltme_1 |
| **Compr Return Gas Temp** | TMP_RGTA | R | °F | | -40-245 | AV:20 | tmp_rgta_1 |
| **Compressor A1 Feedback** | K_A1_FBK | R | | | On/Off | BV:16 | k_a1_fbk_1 |
| **Compressor A1 Relay** | K_A1_RLY | R | | | On/Off | BV:13 | k_a1_rly_1 |
| **Compressor A1 Run Hours** | HR_A1 | R | hr | | 0-9999 | AV:60 | hr_a1_1 |
| **Compressor A1 Starts** | CY_A1 | R | | | 0-9999 | AV:68 | cy_a1_1 |
| **Compressor A2 Feedback** | K_A2_FBK | R | | | On/Off | BV:17 | k_a2_fbk_1 |
| **Compressor A2 Relay** | K_A2_RLY | R | | | On/Off | BV:14 | k_a2_rly_1 |
| **Compressor A2 Run Hours** | HR_A2 | R | hr | | 0-9999 | AV:61 | hr_a2_1 |
| **Compressor A2 Starts** | CY_A2 | R | | | 0-9999 | AV:69 | cy_a2_1 |
| **Compressor A3 Feedback** | K_A3_FBK | R | | | On/Off | BV:18 | k_a3_fbk_1 |
| **Compressor A3 Relay** | K_A3_RLY | R | | | On/Off | BV:15 | k_a3_rly_1 |
| **Compressor A3 Run Hours** | HR_A3 | R | hr | | 0-9999 | AV:62 | hr_a3_1 |
| **Compressor A3 Starts** | CY_A3 | R | | | 0-9999 | AV:70 | cy_a3_1 |
| **Condenser Entering Fluid** | COND_EWT | R | °F | | -40-245 | AV:10 | cond_ewt_1 |
| **Condenser Leaving Fluid** | COND_LWT | R | °F | | -40-245 | AV:18 | cond_lwt_1 |
| **Condenser Pump Relay** | CONDPUMP | R | | | On/Off | BV:2 | condpump_1 |
| **Condenser Pump Run Hours** | HR_DPUMP | R | hr | | 0-9999 | AV:72 | hr_dpump_1 |
| **Control Method** | CONTROL | R | | | 1 = Switch<br>2 = Occupancy<br>3 = Occupancy<br>4 = CCN | MSV:5 | control_msv_1 |
| **Control Mode** | STAT | R | | | 0-9 | AV:8 | stat_1 |
| **Control Point** | CTRL_PNT | R/W | °F | 44.0 | -20-70 | AV:5 | ctrl_pnt_1 |
| **Cooler Entering Fluid** | COOL_EWT | R | °F | | -40-245 | AV:30 | cool_ewt_1 |
| **Cooler Flow Switch** | COOLFLOW | R | | | Open/Close | BV:11 | coolflow_1 |
| **Cooler Fluid** | FLUIDTYP | R | | | 1 = Water<br>2 = Medium Brine | MSV:4 | fluidtyp_msv_1 |
| **Cooler Freeze Protection** | MODE_16 | R | | | On/Off | BV:42 | mode_16_1 |
| **Cooler Leaving Fluid** | COOL_LWT | R | °F | | -40-245 | AV:31 | cool_lwt_1 |
| **Cooler LWT Setpoint** | LWT_SP | | °F | | -20-70 | AV:38 | lwt_sp_1 |
| **Cooler Pump Relay** | COOLPUMP | R | | | On/Off | BV:7 | coolpump_1 |
| **Cooler Pump Run Hours** | HR_CPUMP | R | hr | | 0-9999 | AV:71 | hr_cpump_1 |
| **Cooler Pump Shutdown Dly** | PUMP_DLY | R/W | min | 1 | 0-10 | AV:41 | pump_dly_1 |
| **Cooling Ramp Loading** | CRAMP | R/W | °F | 1.0 | 0.2-2.0 | AV:56 | cramp_1 |
| **Cooling Reset Type** | CRST_TYP | R | | | 1 = No Reset<br>2 = 4-20mA Input<br>3 = External Temp - Oat<br>4 = Return Fluid<br>5 = External Temp - Spt | MSV:7 | crst_typ1_msv_1 |
| **Cooling Setpoint 1** | CSP1 | R/W | °F | 44.0 | -20-70 | AV:53 | csp1_1 |
| **Cooling Setpoint 2** | CSP2 | R/W | °F | 44.0 | -20-70 | AV:54 | csp2_1 |
| **CSM controlling Chiller** | MODE_1 | R | | | On/Off | BV:30 | mode_1_1 |
| **Demand Level 1** | | R/W | | | 0-100 | AV:80 | dmv_lvl_1_perct_1 |
| **Demand Level 2** | | R/W | | | 0-100 | AV:81 | dmv_lvl_2_perct_1 |
| **Demand Level 3** | | R/W | | | 0-100 | AV:82 | dmv_lvl_3_perct_1 |
| **Demand Limit Select** | DMD_CTRL | R | | | 1 = None<br>2 = External Sw. Input<br>3 = 4-20mA Input<br>4 = Loadshed | MSV:8 | dmd_ctrl_msv_1 |
| **Demand Limit Switch 1** | DMD_SW1 | R | | | On/Off | BV:25 | dmd_sw1_1 |
| **Demand Limit Switch 2** | DMD_SW2 | R | | | On/Off | BV:26 | dmd_sw2_1 |
| **Demand/Sound Limited** | MODE_15 | R | | | On/Off | BV:41 | mode_15_1 |
| **Discharge Gas Temp** | DISGAS | R | °F | | -40-245 | AV:15 | disgas_1 |
| **Discharge Pressure** | DP_A | R | psig | | 0-999 | AV:13 | dp_a_1 |

LEGEND

**R** — Read
**W** — Write

# APPENDIX C — BACNET COMMUNICATION OPTION (cont)

## Table G — Network Points List (cont)

| POINT DESCRIPTION | CCN POINT NAME | READ/ WRITE | UNITS | DEFAULT VALUE | RANGE | BACNET OBJECT ID | BACNET OBJECT NAME |
|---|---|---|---|---|---|---|---|
| **Dual Setpoint** | MODE_13 | R | | | On/Off | BV:39 | mode_13_1 |
| **Dual Setpoint Switch** | DUAL_IN | R | | | On/Off | BV:29 | dual_in_1 |
| **Element Comm Status** | | R | | | | BV:2999 | element_stat_1 |
| **Emergency Stop** | EMSTOP | R/W | | Enabled | Enabled/Emstop | BV:6 | emstop_1 |
| **Entering Fluid Temp** | EWT | R | °F | | -40-245 | AV:6 | ewt_1 |
| **High SCT Circuit A** | MODE_21 | R | | | On/Off | BV:47 | mode_21_1 |
| **High Temperature Cooling** | MODE_18 | R | | | On/Off | BV:44 | mode_18_1 |
| **Ice Done** | ICE_DONE | R | | | On/Off | BV:27 | ice_done_1 |
| **ICE Setpoint** | CSP3 | R/W | °F | 32.0 | -20-32 | AV:55 | csp3_1 |
| **Lead/Lag Circuit Select** | LEAD_TYP | R/W | | 1 | 1-3 | AV:43 | lead_typ_1 |
| **Lead/Lag Leaving Fluid** | DUAL_LWT | R | °F | | -40-245 | AV:32 | dual_lwt_1 |
| **Leaving Fluid Temp** | LWT | R | °F | | -40-245 | AV:7 | lwt_1 |
| **Loading Sequence Select** | SEQ_TYPE | R/W | | | 1-2 | AV:77 | seq_type_1 |
| **Low Cooler Suction TempA** | MODE_7 | R | | | On/Off | BV:35 | mode_7_1 |
| **Low Sound Mode** | MODE_25 | R | | | On/Off | BV:51 | mode_25_1 |
| **Low Temperature Cooling** | MODE_17 | R | | | On/Off | BV:43 | mode_17_1 |
| **Machine Operating Hours** | HR_MACH | R | hr | | 0-9999 | AV:57 | mr_mach_1 |
| **Machine Starts** | CY_MACH | R | | | 0-9999 | AV:58 | cy_mach_1 |
| **Making ICE** | MODE_19 | R | | | On/Off | BV:45 | mode_19_1 |
| **Master/Slave control** | MODE_3 | R | | | On/Off | BV:32 | mode_3_1 |
| **Minimum Comp. On Time** | MODE_23 | R | | | On/Off | BV:49 | mode_23_1 |
| **Minimum Load Valve Relay** | MLV_RLY | R | | | On/Off | BV:79 | mlv_rly_1 |
| **Minimum OFF time active** | MODE_10 | R | | | On/Off | BV:38 | mode_10_1 |
| **Minutes Left for Start** | MIN_LEFT | R | min | | 00:00-15:00 | AV:39 | min_left_1 |
| **Minutes Off Time** | DELAY | R/W | min | 0 | 0-15 | AV:42 | delay_1 |
| **Occupancy Status** | OCC | R | | | Yes/No | BV:2008 | occ_status_1 |
| **Outdoor Air Temperature** | OAT | R/W | °F | | -40-245 | AV:1003 | oa_temp_1 |
| **Override Modes in Effect** | MODE | R | | | Yes/No | BV:5 | mode_1 |
| **Percent Available Cap.** | CAPA_A | R | % | | 0-100 | AV:12 | capa_a_1 |
| **Percent Total Capacity** | CAP_T | R | % | | 0-100 | AV:3 | cap_t_1 |
| **Percent Total Capacity** | CAPA_T | R | % | | 0-100 | AV:11 | capa_t_1 |
| **Pump Off Delay Time** | MODE_24 | R | | | On/Off | BV:50 | mode_24_1 |
| **Ramp Load Limited** | MODE_5 | R | | | On/Off | BV:33 | mode_5_1 |
| **Requested Stage** | STAGE | R | | | 0-99 | AV:9 | stage_1 |
| **Saturated Condensing Tmp** | TMP_SCTA | R | °F | | -40-245 | AV:16 | tmp_scta_1 |
| **Saturated Suction Temp** | TMP_SSTA | R | °F | | -40-245 | AV:17 | tmp_ssta_1 |
| **Slow Change Override** | MODE_9 | R | | | On/Off | BV:37 | mode_9_1 |
| **Space Temperature** | SPT | R/W | °F | | -40-245 | AV:2007 | space_temp_1 |
| **Storing ICE** | MODE_20 | R | | | On/Off | BV:46 | mode_20_1 |
| **Strainer Maint. Done** | ST_MAINT | R/W | | | Yes/No | BV:55 | st_maint_1 |
| **Strainer Srvc Countdown** | ST_CDOWN | R | hr | | 0-9999 | AV:52 | st_cdown_1 |
| **Strainer Srvc Interval** | SI_STRNR | R/W | hr | | 0-9999 | AV:51 | si_strnr_1 |
| **Suction Pressure** | SP_A | R | psig | | 0-999 | AV:14 | sp_a_1 |
| **Suction Superheat Temp** | SH_A | R | °F | | -40-245 | AV:44 | sh_a_1 |
| **System Cooling Demand Level** | | R | | | 1-3 | AV:9006 | cool_demand_level_1 |
| **System Demand Limiting** | | R | | | ACTIVE_INACTIVE | BV:83 | dem_lmt_act_1 |
| **Temperature Reset** | MODE_14 | R | | | On/Off | BV:40 | mode_14_1 |
| **Timed Override in effect** | MODE_6 | R | | | On/Off | BV:34 | mode_6_1 |
| **User Defined Analog 1** | | R/W | | | | AV:2901 | user_analog_1_1 |
| **User Defined Analog 2** | | R/W | | | | AV:2902 | user_analog_2_1 |
| **User Defined Analog 3** | | R/W | | | | AV:2903 | user_analog_3_1 |
| **User Defined Analog 4** | | R/W | | | | AV:2904 | user_analog_4_1 |
| **User Defined Analog 5** | | R/W | | | | AV:2905 | user_analog_5_1 |
| **User Defined Binary 1** | | R/W | | | | BV:2911 | user_binary_1_1 |
| **User Defined Binary 2** | | R/W | | | | BV:2912 | user_binary_2_1 |
| **User Defined Binary 3** | | R/W | | | | BV:2913 | user_binary_3_1 |
| **User Defined Binary 4** | | R/W | | | | BV:2914 | user_binary_4_1 |
| **User Defined Binary 5** | | R/W | | | | BV:2915 | user_binary_5_1 |
| **WSM controlling Chiller** | MODE_2 | R | | | On/Off | BV:31 | mode_2_1 |

# APPENDIX D — MAINTENANCE SUMMARY AND LOG SHEETS

## 30MP Weekly Maintenance Log

Plant _____
Machine Model No. _____

| DATE | OIL LEVEL | CHECK ALARMS / FAULTS | OPERATOR INITIALS | REMARKS |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

## APPENDIX D — MAINTENANCE SUMMARY AND LOG SHEETS (cont)

### 30MP Monthly Maintenance Log

| Month | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | / / | / / | / / | / / | / / | / / | / / | / / | / / | / / | / / | / / |
| Operator | | | | | | | | | | | | | | |

| UNIT SECTION | ACTION | UNIT | ENTRY | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Compressor | Check Oil Level | yes/no | | | | | | | | | | | | |
| | Leak Test | yes/no | | | | | | | | | | | | |
| Cooler | Inspect and Clean Cooler | yes/no | Every 3 - 5 Years | | | | | | | | | | | |
| | Inspect Cooler Heater | amps | | | | | | | | | | | | |
| | Leak Test | yes/no | | | | | | | | | | | | |
| | Record Water Pressure Differential (PSI) | PSI | | | | | | | | | | | | |
| | Inspect Water Pumps | yes/no | | | | | | | | | | | | |
| Condenser | Leak Test | yes/no | | | | | | | | | | | | |
| | Inspect and Clean Condenser Coil | yes/no | | | | | | | | | | | | |
| Controls | General Cleaning and Tightening Connections | yes/no | Annually | | | | | | | | | | | |
| | Check Pressure Transducers | yes/no | | | | | | | | | | | | |
| | Confirm Accuracy of Thermistors | yes/no | | | | | | | | | | | | |
| Starter | General Tightening and Cleaning Connections | yes/no | Annually | | | | | | | | | | | |
| | Inspect All Contactors | yes/no | | | | | | | | | | | | |
| System | Check Refrigerant Charge | yes/no | | | | | | | | | | | | |
| | Verify Operation of EXVs and Record Position | 0-100% | | | | | | | | | | | | |
| | Record System Superheat | deg. F | | | | | | | | | | | | |

NOTE: Equipment failures caused by lack of adherence to the Maintenance Interval Requirements are not covered under warranty.

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## START-UP CHECKLIST FOR 30MP LIQUID CHILLER

**(Remove and use for job file.)**

### A. Preliminary Information

JOB NAME _____

LOCATION _____

INSTALLING CONTRACTOR _____

DISTRIBUTOR _____

START-UP PERFORMED BY _____

### B. Preliminary Equipment Check (Yes or No)

Is there any shipping damage? _____ If so, where _____

_____

| | | |
|---|---|---|
| Was it noted on the freight bill? | ☐ YES | ☐ NO |
| Has a claim been filed with the shipper? | ☐ YES | ☐ NO |
| Will this damage prevent unit start-up? | ☐ YES | ☐ NO |
| Check power supply. Does it agree with unit? | ☐ YES | ☐ NO |
| Has the circuit protection been sized and installed properly? | ☐ YES | ☐ NO |
| Are the power wires to the unit sized and installed properly? | ☐ YES | ☐ NO |
| Has the ground wire been connected? | ☐ YES | ☐ NO |
| Are all electrical terminals tight? | ☐ YES | ☐ NO |
| System fluid volume in the loop _____gal (l) | | |
| Does this meet installation guide requirements? | ☐ YES | ☐ NO |
| Water system cleaned per installation guide? | ☐ YES | ☐ NO |
| Minimum flow rates verified per installation guide? | ☐ YES | ☐ NO |
| In-line minimum 40-mesh strainer installed within 10 ft of the cooler/condenser water inlet? | | |
| Cooler: | ☐ YES | ☐ NO |
| Condenser: | ☐ YES | ☐ NO |
| Air separation / bleed devices installed per installation guide? | ☐ YES | ☐ NO |

### C. Cooler Loop Freeze Protection (if required)

Gallons (liters) added:_____

| | | |
|---|---|---|
| Piping includes electric tape heaters if piping is exposed to temperatures below freezing? | ☐ YES | ☐ NO |
| On brine units, has the cooler fluid been properly protected from freezing to at least 15 F (8.3 C) below the lowest anticipated leaving fluid temperature set point? | ☐ YES | ☐ NO |
| Have the main base board, energy management module (option) and control relay connections been checked for tightness? | ☐ YES | ☐ NO |

**(30MPA ONLY)**

Has the refrigerant piping been done per the installation guide? ☐ YES ☐ NO

Piping dehydrated and evacuated per installation guide? ☐ YES ☐ NO

Unit charged per the installation guide? ☐ YES ☐ NO

Crankcase heaters have been energized for a minimum of 24 hours prior to start-up? ☐ YES ☐ NO

**SIGNATURE REQUIRED**

Preliminary check complete.

Installing/Mechanical Contractor_____Date_____

## C. Unit Start-Up (qualified individuals only, factory start-up recommended) (insert check mark as each item is completed)

**EQUIPMENT: Chiller:** MODEL NO. _____ SERIAL NO. _____

**COMPRESSORS:**

CIRCUIT A

MODEL NO. _____

SERIAL NO. _____

Chiller has been properly interlocked with the auxiliary contacts of the chilled fluid pump starter. ☐ YES ☐ NO

Chiller has been properly interlocked with the auxiliary contacts of the condenser water pump starter (30MPA units only). ☐ YES ☐ NO

Compressor oil level is correct. ☐ YES ☐ NO

Liquid line service valve is back seated (30MPA units only). ☐ YES ☐ NO

Set point should be adjusted to the desired cooler leaving fluid temperature.

Leak check **thoroughly**: check all compressors, condenser manifolds and headers, TXVs, solenoid valves, filter driers, fusible plugs, thermistors, and cooler connections using electronic leak detector. Locate, repair, and report any refrigerant leaks.

Check voltage imbalance: AB_____ AC_____ BC_____

AB + AC + BC (divided by 3) = average voltage = _____

Maximum deviation from average voltage =_____

Voltage imbalance = (max. Deviation) x 100 = % voltage imbalance
average voltage

If over 2% voltage imbalance, do not attempt to start chiller! Call local power company for assistance.

Incoming power voltage to chiller modules is within rated unit voltage range? ☐ YES ☐ NO

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

**CHECK PRESSURE DROP ACROSS COOLER.**

Fluid entering cooler: psig (kpa)_____

Fluid leaving cooler: psig (kpa)_____

(psig difference) x 2.31 = ft of fluid pressure drop =_____

Plot cooler pressure drop on performance data chart (located in installation Instructions literature) to determine total gpm (l/s).

Total gpm (l/s) =_____ Unit's rated min gpm (l/s) =_____

Job's specified gpm (l/s) (if available):

NOTE: If unit has low fluid flow, find source of problem: check fluid piping, in-line fluid strainer, shut-off valves, chilled water pump rotation, etc.

**VISUALLY CHECK MAIN BASE BOARD FOR THE FOLLOWING:**

Inspect all thermistors and transducers for possible crossed wires. Check to be sure all well-type thermistors are fully inserted into their respective wells.

**TO START THE CHILLER:**

Turn the emergency on/off switch (SW2) to on position.

Turn the enable/off/remote contact switch (SW1) to the enable position.

If equipped with the optional scrolling marquee, leave the enable/off/remote contact switch (SW1) in the off position.

NOTE: Use escape key to go up one level in the structure.

Use arrow/escape keys to illuminate run status led. Press ENTER key until 'vers' is displayed. Press ENTER key. Record information.

## C. Unit Start-Up (cont)

### Record Software Versions
### MODE — RUN STATUS

| | SOFTWARE VERSION NUMBERS | | |
|---|---|---|---|
| **VERS** | MBB | CESR131482-xx-xx | |
| | EMM | CESR131174-xx-xx | |
| | AUX1 | CESR131333-xx-xx | |
| | MARQ | CESR131171-xx-xx | |
| | NAVI | CESR130227-xx-xx | |

(Press ENTER and ESCAPE simultaneously to obtain software versions)

Use arrow/escape keys to illuminate configuration led. press enter key. record information below.

**UNIT (Configuration Settings)**

| SUBMODE | ITEM | ITEM EXPANSION | DISPLAY | ENTRY |
|---|---|---|---|---|
| **UNIT** | | UNIT CONFIGURATION | | |
| | TYPE | UNIT TYPE | | |
| | SIZE | UNIT SIZE | XXX | |
| | SZA.1 | COMPRESSOR A1 SIZE | XX | |
| | SZA.2 | COMPRESSOR A2 SIZE | XX | |
| | SZA.3 | COMPRESSOR A3 SIZE | XX | |
| | A1.TY | COMPRESSOR A1 DIGITAL? | NO/YES | |
| | MAX.T | MAXIMUM A1 UNLOAD TIME | XX | |

Press ESCAPE key to display ‘UNIT’. Press down arrow key to display ‘OPT1’.
Press ENTER key. Record configuration information below:

**OPTIONS1 (Options Configuration)**

| SUBMODE | ITEM | ITEM EXPANSION | DISPLAY | ENTRY |
|---|---|---|---|---|
| **OPT1** | | UNIT OPTIONS 1 HARDWARE | | |
| | FLUD | COOLER FLUID | X | |
| | MLV.S | MINIMUM LOAD VALVE SELECT | NO/YES | |
| | RG.EN | RETURN GAS SENSOR ENABLE | DSBL/ENBL | |
| | OAT.E | ENABLE OAT SENSOR | DSBL/ENBL | |
| | CSB.E | CSB BOARDS ENABLE | DSBL/ENBL | |
| | CPC | COOLER PUMP CONTROL | OFF/ON | |
| | PM.DY | COOLER PUMP SHUTDOWN DLY | XX MIN | |
| | D.PM.E | ENABLE CONDENSER PUMP | DSBL/ENBL | |
| | D.FL.S | ENABLE COND FLOW SWITCH | DSBL/ENBL | |
| | CDWS | ENABLE COND WTR SENSORS | DSBL/ENBL | |

Press ESCAPE key to display ‘OPT1’. Press down arrow key to display ‘OPT2’.
Press ENTER key.

Record configuration information on next page.

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

## C. Unit Start-Up (cont)

**OPTIONS2 (Options Configuration)**

| SUBMODE | ITEM | ITEM EXPANSION | DISPLAY | ENTRY |
|---|---|---|---|---|
| OPT2 | | UNIT OPTIONS 2 CONTROLS | | |
| | CTRL | CONTROL METHOD | X | |
| | LCWT | HIGH LCW ALERT LIMIT | XX.X ∆F | |
| | DELY | MINUTES OFF TIME | XX | |
| | ICE.M | ICE MODE ENABLE | DSBL/ENBL | |

Press ESCAPE key to display ‘OPT2’. Press down arrow key to display ‘CCN’.
Press ENTER key.

Record configuration information below.

**CCN (CCN Network Configuration)**

| SUB-MODE | ITEM | ITEM EXPANSION | DISPLAY | ENTRY |
|---|---|---|---|---|
| CCN | CCNA | CCN ADDRESS | XXX | |
| | CCNB | CCN BUS NUMBER | XXX | |
| | BAUD | CCN BAUD RATE | X | |

Press ESCAPE key several times to get to the mode level (blank display). Use the arrow keys to scroll to the set point led. press ENTER to display setpoints.

Record configuration information below:

**SETPOINT**

| SUBMODE | ITEM | ITEM EXPANSION | DISPLAY | ENTRY |
|---|---|---|---|---|
| COOL | | COOLING SETPOINTS | | |
| | CSP.1 | COOLING SETPOINT 1 | XXX.X °F | |
| | CSP.2 | COOLING SETPOINT 2 | XXX.X °F | |
| | CSP.3 | ICE SETPOINT | XXX.X °F | |
| HEAD | | HEAD PRESSURE SETPOINTS | | |
| | H.DP | HEAD SET POINT | XXX.X °F | |
| FRZ | | BRINE FREEZE SETPOINT | | |
| | BR.FZ | BRINE FREEZE POINT | XX.X °F | |

**COMPONENT TEST**

USE ESCAPE/ARROW KEYS TO ILLUMINATE CONFIGURATION LED. PRESS ENTER TO DISPLAY 'DISP'. PRESS ENTER AGAIN TO DISPLAY 'TEST' FOLLOWED BY 'OFF'. PRESS ENTER TO STOP DISPLAY AT 'OFF' AND ENTER AGAIN SO 'OFF' DISPLAY FLASHES. 'PASS' AND 'WORD' WILL FLASH IF PASSWORD NEEDS TO BE ENTERED. PRESS ENTER TO DISPLAY 'PASSWORD' FIELD AND USE THE ENTER KEY FOR EACH OF THE FOUR PASSWORD DIGITS. USE ARROW KEYS IF PASSWORD IS OTHER THAN STANDARD. AT FLASHING ~~'OFF' DISPLAY,~~ PRESS THE UP ARROW KEY TO DISPLAY 'ON' AND PRESS ENTER. ALL LED SEGMENTS AND MODE LEDS WILL LIGHT UP. PRESS ESCAPE TO STOP THE TEST. PRESS ESCAPE TO RETURN TO THE 'DISP' DISPLAY. PRESS THE ESCAPE KEY AGAIN AND USE THE ARROW KEYS TO ILLUMINATE THE SERVICE TEST LED. PRESS ENTER TO DISPLAY 'TEST'. PRESS ENTER TO STOP DISPLAY AT 'OFF' AND ENTER AGAIN SO 'OFF' FLASHES. PRESS THE UP ARROW KEY AND ENTER TO ENABLE THE MANUAL MODE. PRESS ESCAPE AND DISPLAY NOW SAYS 'TEST' 'ON'. TURN SWITCH (SW1) TO THE ENABLE POSITION.

PRESS THE DOWN ARROW TO DISPLAY 'OUTS'. PRESS THE ENTER KEY TO DISPLAY 'LL.SV'. PRESS THE ENTER KEY TO STOP DISPLAY AT 'OFF' AND ENTER AGAIN SO 'OFF' FLASHES. PRESS THE UP ARROW KEY AND ENTER TO TURN THE OUTPUT ON. PRESS ENTER SO THE 'ON' DISPLAY FLASHES, PRESS THE DOWN ARROW KEY AND THEN ENTER TO TURN THE OUTPUT OFF. OUTPUTS WILL ALSO BE TURNED OFF OR SENT TO 0% WHEN ANOTHER OUTPUT IS TURNED ON. CHECK OFF THE ITEMS IN THE SERVICE TEST TABLE ON THE NEXT PAGE THAT APPLY AFTER BEING TESTED.

## C. Unit Start-Up (cont)

USE ESCAPE KEY TO RETURN TO 'OUTS' DISPLAY. PRESS DOWN ARROW TO DISPLAY 'CMPA'. PRESS ENTER KEY TO DISPLAY 'CC.A1'. NOTE THAT UNLOADERS AND HOT GAS BYPASS SOLENOIDS CAN BE TESTED BOTH WITH AND WITHOUT COMPRESSOR(S) RUNNING. MAKE SURE ALL SERVICE VALVES ARE OPEN AND COOLER/CONDENSER PUMPS HAVE BEEN TURNED ON BEFORE STARTING COMPRESSORS. CHECK OFF EACH ITEM AFTER SUCCESSFUL TEST. THE CONTROL WILL ONLY START ONE COMPRESSOR PER MINUTE. WHEN AT THE DESIRED ITEM, PRESS THE ENTER KEY TWICE TO MAKE THE 'OFF' FLASH. PRESS THE UP ARROW KEY AND ENTER TO TURN THE OUTPUT ON. CHECK OFF THE ITEMS IN THE SERVICE TEST TABLE BELOW THAT APPLY AFTER BEING TESTED.

**SERVICE TEST**

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT | Completed (Yes/No) |
|---|---|---|---|---|---|---|
| **TEST** | ENTER | | OFF/ON | SERVICE TEST MODE | To Enable Service Test Mode, move Enable/Off/Remote Contact switch to OFF. Change TEST to ON. Move switch to ENABLE. | |
| **OUTS** | OUTPUTS AND PUMPS | | | | | |
| | ENTER | CLR.P | OFF/ON | COOLER PUMP RELAY | | |
| | ↓ | CND.P | OFF/ON | CONDENSER PUMP | | |
| | ↓ | UL.TM | 0 TO 15 | COMP A1 UNLOAD TIME | | |
| | ↓ | CC.H | OFF/ON | CRANKCASE HEATER | | |
| | ↓ | CW.VO | OFF/ON | CONDENSER VALVE OPEN | | |
| | ↓ | CW.VC | OFF/ON | CONDENSER VALVE CLOSE | | |
| | ↓ | LL.SV | OFF/ON | LIQUID LINE SOLENOID | | |
| | ↓ | RMT.A | OFF/ON | REMOTE ALARM RELAY | | |
| **CMPA** | CIRCUIT A COMPRESSOR TEST | | | | | |
| | ENTER | CC.A1 | OFF/ON | COMPRESSOR A1 RELAY | | |
| | ↓ | UL.TM | 0 TO 15 | COMP A1 UNLOAD TIME | | |
| | ↓ | CC.A2 | OFF/ON | COMPRESSOR A2 RELAY | | |
| | ↓ | CC.A3 | OFF/ON | COMPRESSOR A3 RELAY | | |
| | ↓ | MLV | OFF/ON | MINIMUM LOAD VALVE RELAY | | |

Use arrow/escape keys to illuminate the temperatures led. Press ENTER to display 'UNIT'. Press ENTER and use the arrow keys to record temperatures for sensors below.

TEMPERATURE

CLWT _____

CEWT _____

CDET _____

CDLT _____

OAT or DLWT _____

SPT _____

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## C. Unit Start-Up (cont)

**ALL UNITS:**

Measure the following (measure while machine is in a stable operating condition): Check and adjust superheat as required.

| | CIRCUIT A |
|---|---|
| DISCHARGE PRESSURE | _____ |
| SUCTION PRESSURE | _____ |
| DISCHARGE LINE TEMP | _____ |
| SUCTION LINE TEMP | _____ |
| COOLER ENTERING FLUID | _____ |
| COOLER LEAVING FLUID | _____ |
| CONDENSER ENTERING FLUID | _____ |
| CONDENSER LEAVING FLUID | _____ |

Check and adjust superheat as required.

COMMENTS:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

SIGNATURES:

START-UP TECHNICIAN _____ DATE_____

CUSTOMER REPRESENTATIVE _____ DATE_____

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